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Enhancing the employees' innovative behaviour: A social network perspective

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1. COVER ESSAY

Over the last 30 years, there has been a growing interest among the scholars to study the antecedents and consequences of individuals' networks in organizational contexts (Kilduff and Brass, 2010). In much of this work, the researchers have investigated the individual positions within the social networks, such as centrality, or the extent to which an individual can broker between actors that are otherwise disconnected from each other (Landis, 2016). Indeed, an individual position within a network have been a subject of interest to both organization and management scholars, who applied the social network lenses to study a wide range of phenomena including turnover intentions (Soltis et al., 2013), creativity (e.g. Perry-Smith, 2006), innovation (e.g. Carnabuci and Diószegi, 2015) and overall job performance (e.g. Sparrowe et al., 2001). At the same time, and because of the prominent role of individuals' social networks for understanding a wide range of key organizational and management phenomena, another line of inquiry, rooted in the literature of personal psychology, has started to investigate the personality antecedents of individuals' network positions (Tasselli et al., 2015). This line of inquiry has examined how personality differences affect an individual's position in networks of interpersonal relationships. It has been shown, for instance, that self-monitoring personality and the "Big Five" personality traits (i.e., extraversion, conscientiousness, openness to experience, agreeableness, and neuroticism; Selfhout et al., 2010) explain substantial part of the variance in positions that individual actors occupy within a social network (e.g. Klein et al., 2004; Pollet et al., 2011).

Out of many types of networks (e.g. acquaintanceship, friendship, advice), it is the network of informal advice relationships that is most strongly associated with desired organizational outcomes such as creativity and innovation (Lee and Lee, 2015). Indeed, the engagement into informal advice relationships at workplace allows the employees to exchange important organizational resources such as knowledge, information, assistance, and guidance (Phelps et al., 2012; Sparrowe et al., 2001). The position within a network where such resources are exchanged thus, determines the extent to which an individual employee can exploit these resources for successfully pursuing the work-related tasks (Phelps et al., 2012). Following this line of reasoning, in this thesis, I focus on the antecedents and consequences of individual positions within networks of advice relationships.

In the subsequent part of this cover essay, the focus is on antecedents and consequences of two prominent network positions, that is, in-degree centrality and brokerage. The in-degree centrality refers to the number of incoming ties that a focal actor (i.e., an ego), receives from other organizational members (Brass, 1984). This structural variable indicates the degree to which, an ego is sought for advice from his or her coworkers. Brokerage, on the other hand, refers to the degree to which, an actor connects other actors in a network that are otherwise disconnected from each other (Burt, 1992). By bridging the gaps within a social structure (i.e., structural holes), the brokers have timely access to non-redundant information and knowledge that circulates in the different parts of a network as well as control over the flows of these key organizational resources (Burt, 2005; Kilduff and Tsai, 2003). These two network positions are most frequently associated with structural advantage (Fang et al., 2015), and performance-related outcomes (Freeman et al., 1980). Taking into consideration the importance of these two social network features for the desired organizational outcomes such as performance and creativity (Fang et al., 2015), the aim of

this review is to identify the knowledge gaps in the extant literature related to the antecedents and consequences of in-degree centrality and brokerage. On the bases of the identified knowledge gaps, I propose several research questions, which in part have been covered in the three papers included in this doctoral thesis.

ANTECEDENTS OF SOCIAL NETWORK POSITIONS

There is an ongoing debate among the organization and management scholars about the micro-foundations of social networks (Ahuja et al., 2012; Landis, 2016; Fang et al., 2015; Kilduff and Brass, 2010; Tasselli et al., 2015). In much of this work, the focus has been on examining how personality differences—such as the “Big Five” personality traits and self-monitoring personality,—may shape the individuals’ social networks (Tasselli et al., 2015). The origins of this research stream have been rooted in the post-structuralist view of social networks, which suggests that above the structural patterning of the relationships (i.e., the structuralist view), personality differences as well, have impact on the positions that individual actors occupy within a social network (Landis, 2016; Tasselli et al., 2015).

With respect to the antecedents of in-degree centrality, the first consideration stems from the social capital theory, which suggests that people tend to reciprocate the advice relationships in organizational contexts (Agneessens and Wittek, 2011). In other words, individuals who behave in an outgoing, prosocial manner, can be expected to be attractive reference points for the other advice seekers, thus obtaining a central network position. Indeed, extroversion, as a personality trait that depict the extent to which, an individual is outgoing, active, energetic, and assertive (McCrae and John, 1992), has been associated with larger networks at the workplace (Asendorpf

and Wilpers, 1998; Pollet et al., 2011). Nevertheless, the impact of extraversion on in-degree centrality has been probed by Klein et al. (2004), who did not find significant difference between extroverted and introverted team members, and their respective network centrality. Competing results have been found also when the researchers have examined the effect of openness to experience on advantageous network positions. The individuals who are open to experiences will tend to behave in an unconventional manner (McCrae, 1996), thus reducing their capacity to attract new contacts in their individual network (Fang et al., 2015). Similarly, the persons who are anxious, insecure and hostile (i.e., high in neuroticism personality) tend to be repulsive for the other organizational members, thus ending up in less central network positions (Klein et al., 2004). Agreeableness (or the extent to which an individual is cooperative, generous, trusting, and empathetic) on the other hand, is expected to be positively associated with in-degree centrality (Fang et al., 2015; Selfhout et al., 2010). Finally, because of the inherent ability to monitor and control their behaviour in different social situations in which they find themselves, high self-monitors are more likely to end up occupying central network positions than low self-monitors (Mehra et al., 2001).

Indeed, it has been argued that brokerage network positions can be explained by self-monitoring personality (Fang et al., 2015; Tasselli et al., 2015). The individuals who score high in self-monitoring possess social skills that permit them to simultaneously play different, and often incompatible roles (Snyder, 1987). This facilitates their engagement into interaction with different groups of people (Ickes et al., 2006). They do not hesitate to turn out for advice to the most powerful figures in a social network (Fang and Shaw, 2009), to adjust their conversation appropriately (Dabbs et al., 1980), and to take advantage of interpersonal relationships for achieving their own objectives (Fuglestad and Snyder, 2010). Taking into consideration that

brokerage implies coping with differing norms and behaviours that prevail in distant parts of a network (Krackhardt, 1999), it seems that self-monitoring personality can help an individual to easily form ties with different groups in a network (Burt et al., 2013). When the Big Five personality traits are concerned, brokerage in advice networks has been positively associated with extraversion and consciousness, whereas the relationship with agreeableness is expected to be negative (Fang et al., 2015).

However, beyond the personal characteristics, this line of inquiry has overlooked the aspects of motivational orientation, and its effect on advantageous network positions. Work motivation is indeed, a key topic applied in organization and management studies for understanding organizational behaviour as it describes the motives behind individuals' actions (Mitchell and Daniels, 2003). The motives that drive individuals' engagement into work-related activities can be intrinsic or extrinsic to the working process (Deci and Ryan, 1985; Ryan and Deci, 2000). Intrinsic motivation refers to the desire for engagement into a working activity because of the interest, curiosity and enjoyment of the work itself, whereas extrinsic motivation refers to the desire for engagement into a working activity for the sake of factors that are external to the work itself, such as rewards, promotions, and recognitions (Amabile, 1993; Amabile et al., 1994; Ryan and Deci, 2000). Although the extant literature has shown that intrinsic and extrinsic motivations are key determinants of several desired organizational outcomes such as knowledge sharing (Andreeva and Sergeeva, 2016), and creativity (Amabile et al., 1994), it remains unclear how they relate to the structural position of individuals in organizational social networks (Tasselli et al., 2015). Hence, there is an obvious knowledge gap that can be addressed if scholars provide answers to the following research questions:

RQ1: Does the advantageous network positions are determined by the work motivation?

RQ2: How intrinsic and extrinsic motivation differ in explaining the positions that individuals occupy within a social structure?

CONSEQUENCES OF SOCIAL NETWORK POSITIONS

A key explanatory principle underling social network perspective is that the social structure where actors are embedded enables or constrains access to valuable resources inherent in the advice relationships such as guidance, knowledge, expertise, and information (Brass, 1984). Being central within a network, where such resources are exchanged, brings obvious advantages to the actors. The individuals with many incoming ties (i.e., in-degree centrality) can accumulate task-relevant knowledge and information that comes from different sources (Ahuja, 2000; McFadyen and Cannella, 2004). These resources then, can be applied for finding solutions on complex work-related problems, which enhances the performance of employees embedded in central network positions (Baldwin et al., 1997). Following this line of reasoning, the past research has demonstrated that in-degree centrality is strongly associated with popularity and prominence in the workplace (Knoke and Burt, 1983; Wasserman and Faust, 1994). Moreover, the organizational network research has shown that the number of people with whom an individual interacts is beneficial for job performance (Cross and Cummings, 2004), career success (Fang et al., 2015), and innovative behaviour (Perry-Smith, 2006; Perry-Smith and Shalley, 2003). Indeed, from all the consequences that can be caused by positions that employees occupy within a social network, in this thesis, I focus on innovative behaviour. This choice can be grounded on the widespread scholarly consensus that the substantial part of the variance in innovative behaviour is explained

by features of social networks in which individuals are embedded (Baer et al., 2015; Perry-Smith and Mannucci, 2015).

However, the social network perspective on individuals' innovative behavior has grounded its hypothesis on the assumption that individuals build larger networks in order to *receive* valuable benefits (McFadyen and Cannella, 2004). Concurrently, scholarship outside the network research has shown that engagement in prosocial behaviours, that is, *providing* help, assistance, or other kinds of work- or personal-related support to other people (see Brief and Motowidlo, 1986) may bring various benefits to the providers. As the constructivist learning theorists suggest, the exchange of information and knowledge among employees is rarely one directional (Brown & Duguid, 1991; Elkjaer, 2003). When a focal employee provides work-related advice, the resources are not simply transmitted to the recipient, but they flow in both ways (Elkjaer, 2003). Frequent exposure to such combination and re-combination of resources is indeed, the hallmark of individual creativity and innovation (Mors, 2010; Rodan and Galunic, 2004). Moreover, the comprehensive meta-analytic examination provided by Fang et al. (2015), shows that network positions, and in specific, in-degree centrality, partially mediated the effects of various personality traits on performance-related outcomes. Consistent with this line of reasoning, the following research questions are proposed:

RQ3: Does providing work-related advice to many co-workers (i.e., high in-degree centrality) enhance individuals' innovative behaviour?

And in relation to RQ1 stated before, the following research question can be proposed:

RQ4: Does in-degree centrality mediate the relationship between work motivation and innovative behaviour?

Brokerage positions confer different advantages than do positions characterized by high in-degree centrality. A brokerage position provides an individual with access to other individuals (or clusters of individuals) who are disconnected from one another (Burt, 1992). Being the only bridge between separate parts in a network offer three key advantages to the brokers: breadth of non-redundant information from diverse contacts, timeliness of information passing between disconnected groups, and arbitrage in bringing separate groups together (Burt et al., 2013). Such an advantageous position within the social structure represent capital that brokers can use to find a job (e.g. Granovetter, 1973), get promotions at work (e.g. Brass, 1984) and to enhance their innovative behaviour (e.g. Burt, 2004).

Although brokerage provides the focal actor with timely access to non-redundant information and knowledge, such a network position exposes the broker to challenges related to the need of a continuous adjustments of behaviour in order to meet the competing sets of norms that prevail in the distant social circles (Krackhardt, 1999). The differing sets of norms within the disconnected social circles can be explained by the similarity approach of homophily theory, which posits that people tend to form ties with those who are similar to them with respect to certain demographic or social categories such as gender, ethnicity and/or social class (e.g. Blau, 1977; Burt, 2007; McPherson et al., 2001;). Since brokerage position implies connecting otherwise disconnected parts of a network (Baer et al., 2015), homophily theory suggests that these disconnected parts are dissimilar among each other because otherwise, they would have been tied to each other. Therefore, it is assumed that brokers are posited in a network position that allows

them to connect parts of a network that are *dissimilar* among each other (Fang et al., 2015). Because of the differences in the narratives and perspectives in the interaction with members of distant social groups, brokers may struggle to integrate and make sense of the available knowledge and information (Bechky, 2003). Thus, it has been argued that the benefits of brokerage may vanish across the time (e.g. Sasovova et al., 2010).

There is indeed, a growing scholarly interest in investigating the contingencies that enable or impede individuals embedded in brokering network positions to enhance their innovative behaviour (Carnabuci and Diószegi, 2015; Fleming et al., 2007; Tasselli, 2015; Tortoriello and Krackhardt, 2010). For instance, Tortoriello and Krackhardt (2010) have demonstrated that the informal ties that span the formally defined organizational boundaries are more inductive to innovative behaviour when considered in conjunction with cohesive social structure. This example show that the benefits from holding an advantageous network position can be strengthened under specific conditions related to alternative aspects of the social structure in which actors are embedded.

However, there are still considerable knowledge gaps in the literature about the conditions that enable or impede the brokers to integrate and process the information and knowledge that come from the different parts of the network (Tortoriello and Krackhardt, 2010). Having access to non-redundant information and knowledge means that brokers may potentially receive these resources from groups that have completely different perspectives on the work and the organization (Boland and Tenkasi, 1995; Cross and Parker, 2004). Being exposed to different perspectives on how the work should be done may be an important source of novel and useful ideas (Burt, 1992), but at the same time, imposes challenges for brokers to integrate and make sense of the available information and knowledge, which can ultimately undermine their

innovative behaviour (Ahuja, 2000; Cohen and Levinthal, 1990). Following this line of reasoning, the following research question is suggested:

RQ5: How the brokers can facilitate the process of knowledge integration and thus, enhance their innovative behaviour?

SUMMARY OF THE THESIS

In the three papers that follow, the thesis tries to provide answers to the research questions raised in this general introduction. In the first paper, we explore the motivational antecedents of advantageous network positions. Specifically, we propose a counterpoised relationship between intrinsic and extrinsic motivation from one, and in-degree centrality in advice networks on the other hand. We show that intrinsic motivation is positively related to in-degree centrality, whereas the impact of extrinsic motivation on in-degree centrality is negative. Furthermore, we suggest that such an outcome can be expected also when we consider the motivational orientation of the ego's advice providers. With this, we provide new knowledge about the motivational micro-foundations of social networks (Tasselli et al., 2015), thus answering research questions RQ1 and RQ2. In the second study, we go a step further to show that in-degree centrality mediates the relationship between intrinsic motivation and innovative behaviour. These findings contribute to the literatures on motivation and creativity, which have for long focused solely on psychological mechanisms to explain the well-established relationship between intrinsic motivation and innovative behaviour (e.g. Grant and Berry, 2011). With this, we provide further evidence for answering research question RQ1, and open new insights about research questions RQ3 and RQ4. Finally, in the third

paper, we focus on the conditions under which brokerage is related to innovative behaviour. By showing that network diversity moderates this relationship, we contribute to the ongoing debate about the contextual conditions that enable or impede brokers to enhance their innovative behaviour (e.g. Tortoriello and Krackhardt, 2010). With the findings in this study, we offer useful insights about research question RQ5.

The three papers rely on the same dataset, which was collected in a multinational company, located in the Northern Italian region of Lombardy. All the employees ($N = 134$) were invited to participate in our online survey, which was distributed to them via e-mail. The company's core business is providing consulting services and solutions regarding efficient consumption and use of energy. The clients' portfolio is composed of large energy consumers such as manufacturing companies, large corporations as well as public institutions. To satisfy the differing needs of its customers, and at the same time to gain competitive advantage, the company is devoted to nurturing a highly innovative corporate climate. During our preliminary interviews with the director of Human Resources Department, we were informed that the company is highly committed in fostering an environment, where employees are encouraged and rewarded for their innovative behaviour. The individual innovative behaviour is indeed, a substantial part of the overall employees' performance appraisal system. Moreover, the organizational chart of the company shows that the formal structure is set horizontally, which is expected to foster an increased collaboration and interaction among organizational members (Tichy et al., 1979). The preliminary interviews with the HRM further suggested that the company cultivates an informal corporate culture and collaborative leaderships style, where employees are free to choose their collaborators. Taking into consideration the factual conditions, I believe that the company

represents an appropriate empirical setting for addressing the research questions that I would try to address in this thesis.

Apart from the three papers developed in the last three years, my past work as a Ph.D. student in the University of Milan offered me an opportunity to reflect upon few additional research avenues, which I think can be the postulates for my future academic career. For this purpose, I devote the next few lines of this thesis to reveal these, very general ideas, which I think are worth considering.

The first idea concerns the social network brokers, and is closely related to research question RQ5. The initial point for this idea is the ongoing debate about the conditions that strengthen or deteriorate the relationship between brokerage and innovative behaviour (Carnabuci and Diószegi, 2015; Tortoriello and Krackhardt, 2010). The past research has shown that the advantages associated with brokerage network positions may vanish across the time (Sasovova et al., 2010). This is because, brokers connect parts of a network that are dissimilar among each other (Fang et al., 2015), which in turn, requires the brokers to continuously adjust their behaviour in order to obey to the different norms and values that may prevail in dissimilar parts of a network (Krackhardt, 1999). Taking into consideration the argument about instability of brokering network positions that was revealed through a longitudinal study (Sasovova et al., 2010), future research may benefit from applying ethnographic research methods. One may apply the social network approaches to understand the pattern of relationships within an organization, and then an ethnographic approach for understanding what brokers do at the workplace, and how they make sense of their positions. A systematic study on the behaviour of brokers can thus, contribute the extant literature on why some individuals holding brokerage positions can attain their positions across time, and why others fail to do so.

The second research idea can be seen as an extension of the first paper in this thesis, and as such is included in the section revealing the study's limitations and future research. Instead of theorizing that organizational actors perceive their coworkers as intrinsically or extrinsically motivated, future studies may take an altercentric approach to directly capture the perceptions of others about the work motivation of a focal actor. A solid starting point can be the study of Kleinbaum et al. (2015), who investigated how the alters' perceptions about the focal actor's personality moderates the relationship between self-monitoring personality and structural position. They demonstrated that high self-monitors, who were perceived by their alters as empathetic (i.e., able to understand other people's feelings and thoughts) were more likely to occupy brokerage position in a network. Future studies can thus, explore if the relationship between work motivation and indegree centrality will vary across the levels of alters' perceptions about the ego's work motivation. It can be that an individual with high level of intrinsic motivation will be more likely to become central if he or she is perceived by the alters as an individual with high level of intrinsic motivation.

Finally, the literature on creativity and innovation may benefit from comparative research methods for understanding the factors that have differing impact on individuals' innovative behaviour in two diverse organizational contexts. Let us suppose two hypothetical companies, Company X and Company Y that compete in different markets, where innovation is valued differently. Company X competes in a fast-evolving high-tech market, where innovation is the key determinant of organizational long-term survival. Company Y competes in a market of retail food supply, where efficiency rather than innovation is key determinant of organizational success. Still, the innovative behaviour of employees in Company Y is supported and encouraged by the management, as they hope to harness some new ideas from their employees on how to improve

the efficiency in supplying the market with food products. The researchers may explore how the key predicting variables of innovation such as work motivation will differ in the two contexts. It can be that work motivation will be a stronger predictor of innovative behaviour in Company X than it is in Company Y. This is because intrinsic motivation is deemed to explain a considerable proportion of variance in individuals' innovative behaviour by increasing the cognitive flexibility, positive affect, risk-taking, and persistence (Shalley, Zhou, & Oldham, 2004). Intrinsic motivation thus, make individuals to expend more efforts to solve complex tasks, which may be a valid characteristic required from the employees in our hypothetical Company X. On the other hand, extrinsic motivation may be more beneficial for innovative behaviour of the employees in Company Y. Indeed, the extrinsic motives such as material benefits and rewards can increase the capacity of extrinsically motivated individuals to behave in a desired manner in a context that requires high-level of efficiency.

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2. Paper I: Exploring the relationships between intrinsic and extrinsic motivation, and centrality in organizational social networks

Abstract

Although there is a growing interest in studying the emergence of advantageous social network positions, its motivational antecedents have been largely overlooked by the extant literature. We propose that intrinsic and extrinsic motivation of an ego diversely affect ego's indegree centrality in informal networks of advice relationships. Furthermore, we suggest that such an outcome can be expected also when we consider the motivational orientation of the ego's advice providers. To test our theory, we conducted our fieldwork in an Italian consulting company that employs a total of 134 employees, and the response rate was 90%. We discuss the theoretical implications for the organizational social networks and work motivation literatures as well as the practical implications that stem from the findings in this study.

INTRODUCTION

Studying individuals' positions in organizational social networks is key for understanding the individual differences in several desired organizational behaviours such as creativity (e.g. Carnabuci and Diószegi, 2015), job performance (Sparrowe et al., 2001), and career success (Kilduff and Tsai, 2003). One of the most advantageous positions within a social network is indegree centrality, or the number of incoming ties that a focal actor (i.e., ego), receives from other organizational members (Brass, 1984). It indicates the extent to which an ego is sought for advice from his or her coworkers, and it has been associated with power (Brass, 1984), influence (Friedkin, 1993) and job performance (Sparrowe et al., 2001). Indeed, indegree centrality rather than other social network features was found to be the most powerful predictor of variance in job performance and career success (Fang et al., 2015).

Taking into consideration the importance of positions that individuals occupy within organizational social networks, there is a growing stream of literature investigating its individual-level antecedents (e.g. Klein et al., 2004; Sasovova et al., 2010). This line of inquiry studies the personal characteristics and traits that explain why, and how some individuals attain advantageous position within organizational social networks, where they are embedded. It has been shown for example that self-monitoring personality, which depicts the degree to which individuals can control and regulate their social behaviour (Snyder, 1979), is a key antecedent of advantageous network positions (Mehra et al., 2001; Oh and Kilduff, 2008; Sasovova et al., 2010). Because of the inherent ability to monitor and control their behaviour in different social situations in which they find themselves, high self-monitors are more likely to end up occupying central network positions than low self-monitors (Mehra et al., 2001). It has been also demonstrated that the “Big

Five” personality traits (i.e., extraversion, conscientiousness, openness to experience, agreeableness, and neuroticism; Selfhout et al., 2010) explain a substantial part of the variance in network positions (e.g. Klein et al., 2004; Pollet et al., 2011). For example, the past research has shown that extraverts have larger individual networks (Pollet et al., 2011), whereas neurotic people are likely to be avoided by coworkers, thus ending up in less central network positions (Klein et al., 2004).

However, the micro-foundations of social network literature has overlooked the aspect of motivational orientation, and its effect on advantageous network positions. Motivation is indeed, a key topic in psychology and organization studies as it describes the motives behind individuals’ actions, which is fundamental for understanding organizational behaviour (Mitchell and Daniels, 2003). The motives that drive individuals’ engagement into work-related activities can be intrinsic or extrinsic to the working process (Deci and Ryan, 1985; Ryan and Deci, 2000). Thus, intrinsic motivation refers to the desire for engagement into a working activity because of the interest, curiosity and enjoyment of the work itself (Amabile et al., 1994; Ryan and Deci, 2000). On the other hand, the extrinsic motivation refers to the desire for engagement into a working activity for the sake of factors that are external to the work itself, such as rewards, promotions, and recognitions (Amabile, 1993). Although the extant literature has shown that intrinsic and extrinsic motivations are key determinants of several desired organizational outcomes such as knowledge sharing (Andreeva and Sergeeva, 2016), and creativity (Amabile et al., 1994), it remains unclear how they relate to the structural position of individuals in organizational social networks. Does the advantageous network positions are determined by the work motivation? How intrinsic and extrinsic motivation differ in explaining the positions that individuals occupy within a social structure?

The main objective of this study is to provide answers to these questions. By doing so, we respond to a recent call for future research raised by Tasselli et al. (2015), who suggested that the literature still lacks knowledge about the motivational antecedents of advantageous positions in a social structure. Our study thus, make two specific contributions to the extant literature. First, by showing that work motivation predicts advantageous network positions, we contribute the literature on micro-foundations of social networks (Kilduff and Brass, 2010; Landis, 2016; Tasselli et al., 2015). Following the theoretical models of advice-seeking behaviours (Bamberger, 2009; Borgatti and Cross, 2003), we argue that organizational members perceive and value diversely the intrinsically and extrinsically motivated individuals in respect to the quality of advice, the quality of a relationship, as well as the accessibility of a person to share advice. The expectations that result from the differing perceptions influence coworkers' advice-seeking decisions, which in turn, translate into differences in centrality of the focal employee. Moreover, we shed light on the work motivation of ego's imminent environment, and its effects on ego's indegree centrality. We argue that the work motivation of ego's direct contacts (i.e., alters), from whom the ego seeks work-related advice, determine ego's indegree centrality. With this, we contribute the literature on micro-foundations of social networks from an unconventional perspective, which takes into consideration not only the personal characteristics of the focal actor, but also the characteristics of the focal actor's context in which he or she is embedded.

To test our theory, we collected complete network data, and data about work motivation from the employees in an Italian company, which operates in the consultancy sector. In the subsequent parts of the paper, first we set the theoretical framework to ground our hypothesis. Second, we elaborate the research methods that we undertook to test our theory. In the third section, we reveal the results of our empirical analysis. Finally, in the last section, we discuss the

theoretical contributions, the potential limitations and the new avenues for research in the field, as well as the practical implications that stem from the findings in this study.

THEORY

Work motivation and ego's indegree centrality

Work motivation plays a critical role in organizational behaviour as it determines the quality and the extent to which employees will engage into working activities. As the influential self-determination theory suggests, individuals differ in their perceptions of the motives that drive their behaviour (Deci and Ryan, 1985; Ryan and Deci, 2000). Individuals with high level of intrinsic motivation perceive their own engagement into the work-related activities as self-determined, because the work process itself is interesting, enjoyable, and satisfying (Amabile et al., 1994). Because of the interest for the work itself, intrinsically motivated individuals will be prompt to learn thoughtfully about the work activities in which they are involved (Ryan & Deci, 2000). On the other hand, individuals can perceive their own engagement into the working activities as driven by factors that are external to the working process itself (Deci and Ryan, 1985). The extrinsically motivated individuals perceive their behaviour as caused by factors such as rewards, deadlines, surveillance and performance evaluations (Amabile, 1993; Deci and Ryan, 1985). A precise and sublimated definition of the two types of work motivation is provided by Amabile (1993: 188), who stated that “individuals are intrinsically motivated when they seek enjoyment, interest, satisfaction of curiosity, self-expression, or personal challenge in the work”, whereas they are “extrinsically motivated when they engage in the work in order to obtain some goal that is apart from the work itself”. It is important to note that research has shown that intrinsic

and extrinsic motivation are two uncorrelated, orthogonal entities (Amabile et al., 1994). In other words, an individual may be characterized both as highly intrinsically and highly extrinsically motivated. Starting from the assumption about uncorrelatedness between the two entities, we develop our first set of hypotheses about the relationships between intrinsic and extrinsic motivation, and ego's indegree centrality. We postulate our hypotheses on three pillars, which reflect the perceptions, and the corresponding expectations that an advice seeker will take into consideration when deciding his or her advice providers: i) quality of the advice that can be potentially obtained; ii) quality of the relationship with the potential advice provider; and iii) accessibility, and willingness of the advice provider to meet the requests of the advice seeker.

The quality of advice that can be potentially obtained from a person is the first pillar on which we postulate our theory about the relationship between work motivation and ego's network centrality. The information seeking model (Borgatti and Cross, 2003), posits that the probability that an individual will seek advice from another person depends from the perceptions about another's person expertise and skills. If an ego perceives an alter as a person who possess knowledge and expertise that can be useful and applicable within the ego's work-domain, then the ego is likely to ask advice from that person. Thus, the individuals will tend to seek advice from colleagues which, according to their perceptions, can provide them with the best information, knowledge, and expertise, as resources inherent into the advice relationships (Agneessens and Wittek, 2012; Bonaccio & Dalal, 2006; Porter and Woo, 2015). Because of the interest and curiosity to learn about the tasks at hand, intrinsically motivated individuals will invest more time and efforts in work-related activities than the individuals who are less intrinsically motivated (Grant, 2008; Dysvik & Kuvaas, 2013). They are likely to show more persistence, involvement and strong commitment toward learning about the tasks at hand, thus enriching their pool of

domain-relevant knowledge, skills and expertise (Ryan & Deci, 2000). In particular, it has been argued that intrinsically motivated people are prone to persist while performing complex, challenging and unfamiliar tasks (Gagné and Deci, 2005), which makes them successful in creativity and innovation at work (Amabile, 1997; Grant and Berry, 2011). The organizational members involved in the advice relationships, throughout repeated interpersonal interactions are able to perceive the qualities of other people (Salancik and Pfeffer, 1978). Accordingly, we argue that the qualities of intrinsically motivated individuals, in terms of expertise and knowledge in solving complex tasks, will be perceived by the organizational members. Based on these perceptions, they will form positive expectations about the quality of advice that can be obtained in the interaction with intrinsically motivated individuals, and because of the positive expectations, intrinsically motivated individuals will be preferred over other organizational members as desired sources of advice. The reverse logic holds for individuals who possess high level of extrinsic motivation. These individuals perceive their own involvement into work-related activities as caused by factors that are external to the working process itself such as rewards, compensation, and competition with peers (Deci and Ryan, 1985). Unlike the individuals with high level of intrinsic motivation, the extrinsically motivated individuals will engage into working activities with less enjoyment, interest and curiosity to learn about the tasks at hand, which make extrinsically motivated individuals less prone to persist while solving complex, and unfamiliar problems that require ‘out of box’ thinking (Amabile, 1997). Instead, as the past research has found (Amabile et al., 1994), extrinsic motivation will be associated with routine, well-structured work, where the goals and rewards are set by others. In knowledge-intensive environments, this lack of interest to learn about complex problems, and structure-orientation will constrain the capacity of extrinsically motivated individuals to enrich the domain-relevant knowledge and expertise

(Amabile, 1997). As the information seeking model suggests (Borgatti and Cross, 2003), this will translate into fewer advice seeking requests from other organizational members simply because they will hold lower expectations about the quality of advice that can be potentially obtained from an extrinsically motivated individual.

The quality of the relationship of potential advice providers is the second pillar on which we theorize the relationship between work motivation and ego's indegree centrality. In their experimental study, Wild et al. (1997) developed a theoretical model suggesting that by perceiving the task engagement of a target person to be driven by intrinsic motivation, the perceiver will expect that the relationship with the target person will be of a greater quality, and that performing the same task as the target person will be followed by feelings of pleasure and enjoyment. The effects are reversed when the participants in the experiment were exposed to an extrinsically motivated individual. The participants showed lower expectations about the quality of the relationship with the target person, and demonstrated fewer feelings of pleasure and enjoyment for engaging into tasks that were performed by extrinsically motivated individuals. Thus, the perceived quality of a relationship and task engagement will be positive when the observed person is intrinsically motivated, and negative when the observed person is extrinsically motivated. Taking into consideration the expectations that individuals will have about the quality of the relationship and the quality of task engagement, we argue that the organizational members will prefer the individuals with high level of intrinsic motivation over the individuals with high level of extrinsic motivation as their advice providers.

The accessibility, and willingness of an advice provider to meet the requests of the advice seeker is the third factor that links work motivation to ego's indegree centrality. Indeed, being perceived as a reference point for advice seeking within a network does not imply, by default, that

an intrinsically motivated individual will be willing to meet the requests. In an attempt to explore the conditions under which intrinsic motivation actually translates into a willingness to help others, Grant and Berry (2011) for instance, have shown that intrinsic motivation is positively associated with prosocial motivation, suggesting that intrinsically motivated individuals are likely to engage into prosocial behaviours such as providing work-related advice. Thus, beyond being frequently sought for advice, intrinsically motivated employees will be motivated to respond affirmatively to the advice requests. These findings are in line with the knowledge sharing literature, which also suggests that intrinsic rather than extrinsic motivation is a better predictor of tacit knowledge sharing (Jeon et al., 2011; Ozlati, 2015). The individuals who are moved to act because of promises for material benefits such as rewards and compensation, on the other hand, were found to withhold their knowledge and expertise (Stenius et al., 2016). Given that intrinsically motivated individuals do not need external triggers to act (Ryan and Deci, 2000), trust was often theorized as an unnecessary condition for knowledge sharing (Hsu and Lin, 2006; De Clercq et al., 2013). Indeed, Ozlati (2015) has found that trust directed toward the organizational capacity to provide its employees with the necessary conditions for trustworthy behaviour was moderated the relationship between intrinsic motivation and knowledge sharing. Moreover, in his study, Ozlati found a positive moderating of benevolence-based trust, or trusting that knowledge recipients will not misuse the knowledge and information that is a subject of sharing. To sum up, it is intrinsic rather than extrinsic motivation that is positively related to prosocial behaviours such as providing work-related advice, and knowledge sharing. The positive feelings such as enjoyment and challenge in solving complex problems is deeply rooted in intrinsically motivated individuals (Amabile, 1997). They do not need additional triggers to share the knowledge and expertise with other organizational members (Ryan and Deci, 2000), and as a consequence, they are more likely to

meet the advice requests from the peers. On the other hand, extrinsically motivated individuals are likely to withhold their knowledge and expertise if not provided with material or social benefits from their advice seekers (Stenius et al., 2016). According to the information seeking model (Borgatti and Cross, 2003), this increases the costs for other organizational members to seek advice from people with high level of extrinsic motivation.

Taking into consideration all the arguments discussed in this section, we hypothesize that:

H1: Intrinsic motivation is positively associated with ego's indegree centrality within a network of advice relationships.

H2: Extrinsic motivation is negatively associated with ego's indegree centrality within a network of advice relationships.

Alters' work motivation and ego's indegree centrality

We extend our theoretical model above and beyond the relationship between work motivation and ego's indegree centrality. In the next paragraphs, we shed light on the effects of work motivation of alters on ego's indegree centrality. We argue that the work motivation of individuals from whom an ego seeks advice (i.e., his or her alters) can determine ego's indegree centrality within networks of informal advice relationships. For the development of this, second set of hypotheses, we use the same three postulates on which, we grounded our first set of hypotheses. Thus, we theorize that the relationship between work motivation of alters and ego's indegree centrality will depend on: i) the quality of advice that the ego can potentially obtain from his or her alters; ii) the quality of the relationship between the ego and his or her alters; and iii) the accessibility, and the willingness of alters to meet the ego's requests.

The first postulate on which we base our theory that work motivation of alters predicts ego's indegree centrality is the quality of advice that the ego can potentially obtain from his or her advice providers. The information seeking model posits that an individual seeks advice from another individual if he or she expects that that other individual possesses the domain-relevant knowledge and expertise needed for successful completion of the task for which the advice has been sought (Borgatti and Cross, 2003). As we have already discussed, there are sound arguments to believe that intrinsically motivated individuals—because of the interest and curiosity to learn about the tasks at hand (Deci and Ryan, 1985)—continuously enrich the pool of domain-relevant knowledge and expertise needed for solving complex problems and tasks (Amabile, 1997). If intrinsically motivated individuals are likely to be experts in solving complex problems and tasks (Amabile, 1997), asking advice from these individuals means that the advice recipient (i.e., the ego) obtains information, knowledge, and assistance that are of relatively high quality. The high-quality advice received from intrinsically motivated individual can enhance ego's competences for solving complex problems and tasks. Once the ego has increased his or her domain-relevant knowledge and expertise, he or she becomes a relevant reference point, from whom, the other organizational members will seek advice. Therefore, we argue that seeking advice from intrinsically motivated alters, will increase ego's indegree centrality. On the other hand, having advice providers that are extrinsically motivated decreases the chances that the ego will obtain high quality advice required in knowledge-intensive environments. The extrinsic motives such as material benefits and status at the expense of the interest and curiosity to solve challenging tasks, will constrain the capacity of extrinsically motivated individuals to enrich their domain-relevant knowledge and expertise (Amabile, 1997). Asking advice from alters that have constrained capacity to solve complex and challenging problems means that the ego receives information and

knowledge that are of lower quality. This in turn, compromises the ego's knowledge and expertise needed for solving complex problems. The lack of knowledge and competences is perceived by other organizational members, and because of their expectations for high quality advice, they will tend to avoid the ego as a reference point for advice seeking. As a result of this avoidance, we expect that the egos who seek advice from extrinsically motivated individuals, will be less central within the networks of advice relationships.

The quality of the relationship between the ego and his or her alters is the second pillar on which we ground the hypothesis that work motivation of alters is associated with ego's indegree centrality. The theoretical model provided by Wild et al. (1997) suggests that ego's expectations about relationship quality with an alter will vary in respect to the perceptions held by the ego about work motivation of the alter. When an ego perceives his or her alter as intrinsically motivated, the ego will generate positive expectations about the quality of the interpersonal relationship with the alter. In other words, the ego will expect that the alter will support his or her personal autonomy but also that the engagement in the task will be followed by feelings of enjoyment and interest (Wild et al., 1997). Having an egocentric network of relationships with intrinsically motivated individuals will therefore, increase the interest and enjoyment for the work-related activities of the ego. Such positive feelings will increase the likelihood that the ego itself, will become a reference point for the advice seekers. On the other hand, the effects are reversed when the ego asks advice from extrinsically motivated alters. Being surrounded with individuals from whom the expectations about relationship quality are low translates into lesser enjoyment and interest for the tasks at hand. Such a behaviour will be perceived by other organizational members, who in turn, will try to avoid the ego when asking advice.

The third argument linking work motivation of alters with ego's indegree centrality is the accessibility of the alters. Indeed, asking advice from intrinsically motivated individuals increases the likelihood that the ego will essentially receive the requested advice. As the scholars in knowledge management literature have argued (Jeon et al., 2011; Ozlati, 2015), it is intrinsic rather than extrinsic motivation that is positively related to knowledge sharing. Accordingly, we argue that the ego who seeks advice from intrinsically motivated alters will essentially acquire the requested information and knowledge inherent into the advice relationships, thus giving rise to his or her own competences and skills. Having acquired new, high quality knowledge and expertise, the ego itself will become a desired actor from whom, the other organizational members will prefer to consult for advice on work-related issues. This will not be the case if the ego asks advice from extrinsically motivated alters. Driven by motives such as status and competition with the peers (Deci and Ryan, 1985), the extrinsically motivated alters will be less interested in knowledge sharing (Stenius et al., 2016). Thus, the ego risks not to obtain, or to obtain only selective and limited information and knowledge from an extrinsically motivated alter. This knowledge deficit will be perceived by the ego's colleague who, driven by the interest to maximize the quality of the advice that can be potentially obtained in the social network (Borgatti and Cross, 2003), will tend to avoid the ego as a potential advice provider. Consequently, the ego that is surrounded with extrinsically motivated advice providers will end up in a less central network position. Following this line of reasoning, we hypothesize that:

H3: Alters' intrinsic motivation is positively associated with ego's indegree centrality within a network of advice relationships.

H4: Alters' extrinsic motivation is negatively associated with ego's indegree centrality within a network of advice relationships.

METHODS

Empirical setting and data collection

We conducted our fieldwork in a medium-size international company located in the northern Italian region of Lombardy. For preserving its anonymity, in this paper, we will use the Italian term for energy, “Energia”, as a name of the company. Founded in 2008, Energia is nowadays a leading company in the Italian market for energy consulting. Energia provides its clients (i.e., large-scale energy consumers such as manufacturing companies and governmental agencies) with innovative, and customized solutions for optimization of their energy consumption.

The organizational chart of the company shows that the formal structure of Energia is horizontal. The total of 134 employees of Energia are divided into five business units, and in each business unit, the departments are set on a lateral hierarchical level. Such a flat organizational structure is expected to foster an increased collaboration and interaction among organizational members (Tichy et al., 1979). The preliminary interviews that we conducted with the representatives of Energia's Human Resources Management (HRM) department, further suggested that Energia cultivates an informal corporate culture and collaborative leaderships style, where employees are free to choose their collaborators and the decision-making process is decentralized. Moreover, the interviews with the HRM department representatives revealed that Energia provides its employees with a competitive compensation system based on variable pay and salaries above

the industry average. Given the competitive compensation system, Energia is considered as an attractive company in the respective labour market for extrinsically motivated individuals, whose main drivers to engage into the work-related activities are related to factors such as compensation and pay (Amabile et al., 1994). On the other hand, the informal corporate culture, the collaborative leadership style that involves employees in decision-making, the autonomy offered to the employees, and the variety and complexity of the different jobs in the company represents an attractive setting for the intrinsically motivated individuals, who are expected to value the abovementioned environmental characteristics (Deci and Ryan, 1987). Thus, it appears that the working context in Energia is favourable for both intrinsically as well as extrinsically motivated employees. Taking into consideration the formal organization of the company as well as the statements of HRM department representatives, we believe that Energia represents an appropriate empirical setting for testing our theory which posits that work motivation of the focal actor, and work motivation of his or her alters, predicts focal actor's centrality in a network of informal advice relationships.

The sample that we used for the empirical analysis includes all the 134 employees of Energio. Such a sample size is comparable to several recent studies that have analysed data on complete social networks (e.g. Zhou et al., 2009; Wang et al. 2015). We have collected the data by distributing, via e-mail, an online questionnaire that was translated into Italian language. It is important to note that the data on intrinsic and extrinsic motivation were provided by each participant, whereas in-degree centrality in the informal network of advice relationships is product of the answers provided by all participants in the survey. The data collection from different sources can indeed, help in mitigating the risk for common measurement bias in quantitative research methods (Podsakoff et al., 2003). From a total of 134 employees invited to participated, 120

completed the survey, allowing us to obtain a response rate of 90%. From those that have participated, it appears that an average employee of Energio is a 34 years old male (63% males), holds a Master's degree, and has been with the company for 2.18 years.

The informal advice relationships at work represent the key sources of valuable organizational assets such knowledge, information, assistance and guidance (Sparrowe et al., 2001), and consequently, are fundamental for getting work done in organizations (Shah et al., 2015). We applied the “roster method” for collecting the data about the network of informal advice relationships at Energio. Past research has shown that such a ‘recall’ approach that is characteristic for the roster method can decrease the cognitive efforts of the respondents when selecting their contacts (Carnabuci & Dioszegi, 2015). Thus, every employee of Energio was asked to select his or her contacts from a list containing all the employees in the company. We have not imposed any restrictions on the number of contacts that one can select, as it has been shown that leaving the choice open reduces the measurement error (Wong, 2008). We asked the employees of Energio the following question, to capture information about their contacts from whom they ask work-related advice: “When faced with work-related issues and problems the people could turn to their colleagues and/or supervisors for asking advice. Looking back at the last year, to whom of your colleagues do you turn to for advice in professional, technical, or work-related matters?” For each of the selected advice providers, the respondents were then asked to report frequency of advice seeking, and the possible choices included: “At least once a week”; “At least once a month” and “Less than once a month”. The number of advice providers reported by a respondent ranged from 1 to 35, and on average, an employee has nominated 6.83 (sd = 6.68) contacts. Almost two thirds of all the ties (i.e., 63.04%) among the lower ranked employees of Energio's (i.e., the employees without a supervisory role, or 77% of the entire sample) were at a lateral hierarchical level, whereas

60.37% spanned the departmental boundaries. These statistics describing the network data confirmed our presumption that the informal advice relationships are key means for interpersonal exchanges of important organizational resources such as information and knowledge.

Measures

Indegree centrality. The indegree centrality is a key social network variable that measures the number of nominations received by a focal employee from the other organizational members (Brass, 1984). Taking into consideration that our network concerns the informal advice relationships, the number of nominations indicates the frequency to which a focal employee is sought out for advice by his or her colleagues at the workplace. In order to mitigate the potential effect of formal authority mirrored into the informal advice relationships (Oh et al., 2006), we have excluded the advice seeking ties directed toward the supervisors. Thus, the ties directed from the subordinates toward the supervisors were excluded. For example, if Marco supervises Giovanni, and Giovanni nominated Marco as a person from whom he asks advice, the in-degree centrality of Marco will be subtracted by one. The in-degree centrality ranged from 0 to 20, and on average, an employee of Energio was nominated by 5.24 colleagues ($sd = 4.34$).

Work motivation. We measured intrinsic and extrinsic motivation with a 30-items scale, originally developed by Amabile et al. (1994). The original scale or its variations has been widely used in several successive studies within organizational, management, and human psychology scholarship (e.g. Perry-Smith, 2006; Tierney et al., 1999). The scale has been validated on large samples including both working adults as well as student undergraduates, and it has produced similar scores when applied at the same observations at different points of time. Accordingly, Amabile et al.

(1994) have argued that work motivation is a relatively stable and enduring individual characteristic. The scale has two sub-scales of 15-items each, intended to measure intrinsic and extrinsic motivation. Sample items that measure intrinsic and extrinsic motivation include: “The more difficult the problem, the more I enjoy solving it”, for intrinsic motivation; and “I am concerned about how other people are going to react to my ideas” for extrinsic motivation. The response format was a value scale that ranged from 1 = “strongly disagree” to 8 = “strongly agree”. Consistent with the study of Amabile and colleagues (1994), our empirical results show that intrinsic and extrinsic motivation are two orthogonal constructs, with a correlation coefficient of almost zero ($r = -0.04$). It means that a high level of intrinsic motivation does not imply a low level of extrinsic motivation and vice versa. Cronbach’s alpha was 0.70 for the intrinsic motivation sub-scale and 0.71 for the extrinsic motivation sub-scale.

Average work motivation of alters. We calculated the two variables, that is, average intrinsic and extrinsic motivation of the alters following “ego network composition” procedure in UCINET 6.599. The two variables measure the average intrinsic and the average extrinsic motivation of ego’s outgoing ties. Let us make an example with three hypothetical employees of Energio, Maria, Elena, and Claudia. Let us assume that Maria has nominated both Elena and Claudia as her contacts, from which she has sought advice. Maria has reported that during the past period of one year, she turned out for advice to Elena at least once a week, while for the same time lag, she turned out for advice to Claudia, less than once in a month. Let us further assume that Elena’s intrinsic and extrinsic motivations are 70 and 100, respectively; whereas Claudia’s intrinsic and extrinsic motivations are 90 and 60, respectively. Then, the average intrinsic motivation of Maria’s

alters will be the average intrinsic motivation of Elena and Claudia, weighted for the frequency of their communication. Maria's average intrinsic motivation of her alters will be equal to:

$$(70 \times 3 + 90 \times 1) / 4 = 75$$

and the average extrinsic motivation of her alter will be:

$$(100 \times 3 + 60 \times 1) / 4 = 90$$

Thus, both the average intrinsic and the average extrinsic motivation of Maria's alters are weighted for the frequency of advice seeking from Elena and Claudia, which we have coded as 1 and 3, respectively. Indeed, because Maria spends much more time in communication over work-related issues with Elena rather than Claudia, it is appropriate for us to assume that she may be affected more by the work motivation of Elena and less by the work motivation of Claudia.

Control variables. We controlled for several variables that can potentially confound our estimates of interest. Controlling for employees' *age* is important as it may affect the social experiences and perceptions, which in turn, may affect the focal actor's centrality in social networks (Klein et al., 2004). Moreover, drawing on the similarity approach, the past research has shown that age is an important demographic variable that affects the formation of advice relationships (Ibarra, 1992). We controlled for respondents' gender because it may affect the extent to which an individual may access the resources embedded in advice relationships (Ibarra, 1993). In this study, gender is a dummy variable, coded as 0 if the respondent is female and 1 if the respondent is male. We kept the level of education constant as it has been found that it may be correlated to network centrality (Ibarra and Andrews, 1993). Matching the Italian higher education system, the level of education variable ranged from 1 to 4, where 1 = High school diploma, 2 = Bachelor's degree (three years), 3 = Bachelor's degree (3 years) + post-graduate specialization (2 years) or post-secondary

academic degree, according to the old Italian system of higher education (4 years), and 4 = Master's degree or higher.

We controlled also for two contextual variables such as *job tenure* and *hierarchical position*. Controlling for job tenure is important because past research has found that the years spend within an occupation may affect intrinsic motivation (Amabile et al., 1994), and network centrality (Erdogan et al., 2015). Hierarchical position was kept constant as the prior research has shown that it associated with centrality (Ibarra & Andrews, 1993). The variable, in our study, ranged from 1 to 4 in an ascending order, where 1 = employees without supervisory roles, 2 = middle managers, 3 = the upper management, and 4 = the co-founders, including the CEO.

In addition to the demographic and contextual variables, we controlled for two structural variables, that is *number of friends*, and *out-degree centrality in advice relationships*. We controlled for the number of friends as the past research has demonstrated that friendship ties may affect one's centrality in networks of work-related advice relationships (Rank et al., 2010). For this purpose, we collected data relative to the friendship relations in Energio. Applying the same approach that we used for collecting data on advice relationships, we used a roster method, asking each employee to select the contacts that he or she considers friends. Specifically, we asked the following question: "Considering all the employees in Energio, please indicate the colleagues you regard as your friends". We did not impose any restrictions on the number of friends that can be selected, and for each contact nominated as a friendship tie, we asked the respondents about the strength of the relationship followed by a response that ranged from "weak" to "very strong". Following the provisions from prior research, we considered that two employees are friends only if they both have reported a friendship tie towards each other, that is, we considered only the reciprocated friendship ties (Balkundi et al., 2007). Moreover, we controlled for *outdegree*

centrality, or the number of outgoing ties that the ego has reported as advice providing ties. Controlling for outdegree centrality may be important as the social capital theory suggests that people tend to reciprocate the advice relationships in organizational contexts (Agneessens & Wittek, 2011). In other words, the number of advice providers of an ego (i.e., outdegree centrality) may affect the number of advice seekers (i.e., indegree centrality) of that ego.

We controlled also for *self-monitoring*—that is, individuals' ability to adopt the behaviour in response to different social situations in which they find themselves—as it has been found that high self-monitors tend to have larger networks of social relationships (Oh & Kilduff, 2008). We measured self-monitoring by using 12-items scale, originally developed by O'Cass (2000). The response format was a Likert scale that ranged from 1 = “strongly disagree” to 6 = “strongly agree”. Cronbach's alpha was 0.85.

Finally, following the study of Erdogan et al. (2015), we controlled for employees' job performance, as it may affect the frequency at which, an employee is sought out for advice. We obtained the employees' job performance from Energia's HRM department. Energia's HRM department sent to the authors of this paper the corporate policy for performance evaluation in a written form. The corporate policy for job performance evaluation comprises three quantitative and qualitative objectives that are set out on beginning of the year for each employee, independently. Every employee, depending on the role, has different objectives to achieve throughout a year. The supervisors are responsible for following up, and evaluating subordinates' job performance. By the end of the year the supervisors are supposed to report job performance evaluation to the HRM department. Since we did not know the specific objectives for all the employees, we treated job performance as a single-item variable, which may range from 1 (unsatisfactory performance) to 5 (excellent performance).

RESULTS

In Table 1 we present the means, standard deviations, score ranges and pairwise correlations between the variables of interest. The preliminary evidence supports our hypotheses as indegree centrality is positively correlated with intrinsic motivation ($r = 0.18$, $p < 0.05$) and the average intrinsic motivation of the alters ($r = 0.25$, $p < 0.01$), whereas it is negatively correlated with extrinsic motivation ($r = -0.23$, $p < 0.01$) and the average extrinsic motivation of the alters ($r = -0.39$, $p < 0.01$). Moreover, none of the predicting variables are correlated with each other, except the correlation coefficient between the average intrinsic motivation of alters and the average extrinsic motivation of alters, which is negative and significant ($r = -0.25$, $p < 0.01$). For checking further if we have problems of multicollinearity, we calculated the variance inflation factor (VIF) for all the predicting variables in the regression equation, and their values were all far below 10 as a rule of thumb (e.g. the highest VIF was for hierarchical position, equal to 1.74).

Table 1: Pairwise correlations between the variables of interest

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Indegree centrality	1													
2 Age	0.14	1												
3 Gender	0.11	0.03	1											
4 Education	0.08	-0.05	0.11	1										
5 Job tenure	0.35**	0.21**	-0.07	-0.09	1									
6 Hierarchical position	0.40**	0.39**	0.06	0.22**	0.37**	1								
7 Self-monitoring	0.03	0.06	-0.05	0.10	0.01	0.05	1							
8 Number of friends	0.26**	-0.07	-0.07	0.01	0.13	-0.05	0.08	1						
9 Job performance	0.04	0.07	0.05	-0.09	0.15	0.01	-0.02	-0.06	1					
10 Outdegree centrality	0.23**	0.13	0.12	0.00	0.20*	0.34**	0.16†	0.17†	-0.10	1				
11 Intrinsic motivation	0.18*	0.10	-0.01	0.05	-0.02	0.07	0.39**	0.00	-0.06	0.14	1			
12 Extrinsic motivation	-0.23**	-0.22*	0.06	0.15†	-0.10	-0.13	0.16†	0.00	-0.10	0.01	-0.04	1		
13 Intrinsic motivation of alters	0.25**	0.02	-0.02	0.02	0.15†	0.03	-0.03	-0.06	-0.07	-0.06	-0.09	-0.11	1	
14 Extrinsic motivation of alters	-0.39**	-0.35**	0.06	-0.06	-0.30**	-0.42**	-0.06	-0.03	-0.12	-0.13	-0.10	0.11	-0.25**	1

† p < 0.10

* p < 0.05

** p < 0.01

We present our OLS estimations in Table 2 below. All the models are nested such that Model 1 estimates a specification including only the control variables; Model 2 through Model 5 estimate the independent effects of each of our four independent variables; whereas Model 6 estimates a specification including all the variables of interest. The inclusion of every independent variable separately, improves the overall fit of each of the models (i.e., Model 2 through Model 5): The difference in F-tests between Model 1 and Model 2 is significant at the 0.05 level ($F(1,109) = 5.22$); The difference in F-tests between Model 1 and Model 3 is significant at the 0.05 level ($F(1,109) = 5.69$); The difference in F-tests between Model 1 and Model 4 is significant at the 0.01 level ($F(1,109) = 8.96$); and the difference in F-tests between Model 1 and Model 5 is significant at the 0.01 level ($F(1,109) = 7.39$). Finally, including all the independent variables at once, as presented in Model 6, improves the overall model fit as the difference in F tests between Model 1 and Model 6 is significant at the 0.01 level ($F(4, 106) = 6.28$). Furthermore, in comparison to all other models, the proportion of variance explained in Model 6 is highest ($R\text{-adjusted} = 0.35$), and this is another indication of overall model fit.

Table 2: The OLS Models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-4.74* (1.87)	-4.50* (1.83)	-4.45* (1.80)	-4.27* (1.84)	-3.01 (1.91)	-2.68 (1.82)
<i>Control variables</i>						
Age	-0.01 (0.05)	-0.02 (0.05)	-0.01 (0.05)	-0.03 (0.05)	-0.04 (0.05)	-0.05 (0.05)
Gender	1.07 (0.74)	1.09 (0.73)	1.07 (0.72)	1.19 (0.73)	1.25† (0.72)	1.31† (0.68)
Educational level	0.08 (0.38)	0.07 (0.37)	0.04 (0.37)	0.20 (0.38)	0.04 (0.37)	0.11 (0.35)
Job tenure	0.44* (0.20)	0.46* (0.19)	0.33† (0.19)	0.45* (0.19)	0.37† (0.19)	0.32† (0.18)
Hierarchical position	2.21** (0.70)	2.20** (0.68)	2.25** (0.67)	2.04** (0.69)	1.70* (0.70)	1.75** (0.67)
Number of friends	0.50** (0.16)	0.52** (0.16)	0.54** (0.16)	0.48** (0.16)	0.48** (0.16)	0.52** (0.15)
Self-monitoring	-0.00 (0.05)	-0.04 (0.05)	0.00 (0.05)	0.02 (0.05)	-0.01 (0.05)	-0.03 (0.05)
Out-degree centrality	0.02 (0.06)	0.00 (0.06)	0.03 (0.06)	0.02 (0.06)	0.02 (0.06)	0.02 (0.05)
Job performance	0.15 (0.67)	0.22 (0.66)	0.36 (0.65)	0.03 (0.66)	-0.05 (0.65)	0.16 (0.63)
<i>Independent variables</i>						
Intrinsic motivation		0.09* (0.04)				0.08* (0.04)
Intrinsic motivation of alters			0.20** (0.07)			0.17* (0.07)
Extrinsic motivation				-0.07* (0.03)		-0.06* (0.03)
Extrinsic motivation of alters					-0.08** (0.03)	-0.06* (0.03)
N	120	120	120	120	120	120
F	4.90	5.10	5.63	5.17	5.49	5.98
R-squared	0.29	0.32	0.34	0.32	0.33	0.42
Adj. R-squared	0.23	0.26	0.28	0.26	0.27	0.35
† p < 0.10						
* p < 0.05						
** p < 0.01						

We found support for all of our hypotheses. Throughout models 2 and 5 we show that all independent variables are sole predictors of indegree centrality. However, in Model 6 we show that even when controlling for all the independent variables at once, each independent variable is significant predictor of indegree centrality. Thus, we found support for H1 as intrinsic motivation of the ego was positively related to ego's indegree centrality ($b = 0.08, p < 0.05$). The average intrinsic motivation of alters was positively related to ego's indegree centrality ($b = 0.17, p < 0.05$), thus supporting our H2. On the other hand, we found negative relationship between extrinsic motivation and indegree centrality ($b = -0.06, p < 0.05$), thus supporting our H3. Finally, we supported our H4 as the relationship between ego's indegree centrality and the average extrinsic motivation of alters was negative and significant ($b = -0.06, p < 0.05$).

DISCUSSION

In this study, we examined the motivational antecedents of social network positions. In specific, we showed that intrinsic and extrinsic motivation, as widely accepted construct that depict one's motivational orientation toward the work, diversely affect ego's network centrality. The association with ego's network centrality is positive for intrinsic motivation, whereas it is negative for extrinsic motivation. Beyond the diverse effect of work motivation on ego's network centrality, in the present paper, we demonstrate that the motivational orientation of the ego's direct contacts (i.e., alters) within a network affects ego's network position. Our study reveals that the individuals who seek advice from intrinsically motivated alters are more likely to become central figures within a network. On the other hand, our model suggests that the individuals who seek advice from extrinsically motivated alters, are likely to become less central within a network of advice

relationships. These findings have important theoretical and practical implications, which we discuss in the following paragraphs. We conclude our study with a discussion about the potential limitations, and the opportunities for future research in the field.

Theoretical contributions

There is growing interest among organizational scholars to understand the characteristics of actors that occupy advantageous positions within a social structure (Kilduff and Brass, 2010). It has been shown for instance, that self-monitoring personality—that is, the extent to which individuals can control and regulate their social appearance and interpersonal relations (Snyder, 1979)—is a powerful predictor of structural advantage (Mehra et al., 2001; Oh and Kilduff, 2008; Sasovova et al., 2010). High self-monitors, because of their ability to adopt the behaviour in respect to the different social situations in which they find themselves, are likely to attain central network positions in friendship and workflow networks (Mehra et al., 2001). Apart from the self-monitoring personality, the research has accumulated rich empirical evidence demonstrating that the “Big Five” personality traits (i.e., extraversion, conscientiousness, openness to experience, agreeableness, and neuroticism; Selfhout et al., 2010) are also powerful predictors of social network positions (e.g. Klein et al., 2004; Pollet et al., 2011). In their comprehensive meta-analysis, Fang et al. (2015) have examined the relationship between all the above-mentioned personality variables and network positions (i.e., indegree centrality and brokerage) in expressive and instrumental networks. The study shows that self-monitoring personality as well as conscientiousness were positively related to indegree centrality in instrumental networks such as networks of advice relationships. On contrary, the effect on indegree centrality was negative for openness to experience, and neuroticism. The organizational research studying self-monitoring

and Big Five personality traits has thus, significantly enhanced our understanding on how personality relates to the attainment of key network positions.

However, this line of inquiry has overlooked the motivational orientations of the individuals as a possible antecedent of advantageous network positions (Tasselli et al., 2015). Similar as for the personality traits, the research has shown that motivational orientation toward the work is a powerful predictor of desired organizational outcomes such as creativity and overall job performance (Aryee et al., 2015; Grant and Berry, 2011; Tierney et al., 1999). Indeed, the organizational research has started to integrate the research on personality and social networks because of the rich empirical evidence showing that individual differences may predict desired organizational outcomes (Tasselli et al., 2015). Taking into consideration that motivational orientation is an enduring personal characteristic that can predict organizational outcomes (Amabile et al., 1994), it follows that there is a notable research gap in the organizational literature that overlooked the possible relationship between work motivation and advantageous network positions. The aim of this paper was to cover this theoretical gap by providing sound theoretical model and empirical evidence for the relationship between work motivation and indegree centrality. With this, we respond to the call for future research raised by Tasselli et al. (2015), who argued that literature still lacks knowledge about the motivational antecedents of advantageous positions in a social structure. It is important to note that our choice to study indegree centrality as a dependent variable is consistent with the provisions of the meta-analytic examination provided by Fang et al. (2015), who showed that indegree centrality rather than brokerage is a more powerful predictor of career success and job performance.

The conceptual framework and the empirical findings in this study have two specific theoretical contributions for the extant literature. First, by showing that ego's work motivation is

an important antecedent of ego's network centrality, we contribute to the current debate in the literature on micro-foundations of personality in context of social networks (Ahuja et al., 2012; Erdogan et al., 2015; Tasselli et al., 2015). We demonstrate that work motivation shape the imminent social structure of organizational actors, beyond and above the well-established personality variables such as self-monitoring, which we kept constant in our OLS model. Moreover, the effect of work motivation on ego's indegree centrality is significant even when we control for job performance, which provides additional robustness of our findings (Erdogan et al., 2015). By showing that work motivation determines ego's centrality within advice networks while controlling for job performance, we eliminate, in part, the possibility that such a network position is caused by actor's past performances. Indeed, our theorization about how an individual becomes attractive advice provider for the coworkers is consistent with the network generation theory, which posits that one should incorporate the expected values and costs in order to understand the emergence of network centrality (Bamberger, 2009). Accordingly, we theorized that the quality of the advice, quality of the relationship and accessibility of the advice that organizational actors perceive when interacting among each other, will determine the choice of organizational actors from whom to seek advice. We argue that individuals with higher level of intrinsic motivation are likely to be perceived as important sources of information and knowledge for their coworkers because of the higher quality of advice that is expected from them, the better relationship quality, and a greater accessibility of intrinsically motivated individuals towards the advice requests raised by the coworkers. Consequently, the intrinsically motivated individuals are frequently sought for advice from their coworkers and thus, become more central figures within a network of advice relationships. The reverse logic holds for extrinsically motivated individuals, as the coworkers will perceive them as less expert advice providers from which relatively lower quality of advice is to

be expected. Moreover, the coworkers will perceive the potential relationship with an extrinsically motivated individual of a lower quality, and the accessibility to such a person, harder (Wild et al., 1999). Therefore, the extrinsically motivated individuals will be less attractive for their coworkers as potential advice providers, which in turn, will bring them into less central network positions.

The second contribution of this paper emerges from the empirical support for our hypotheses that work motivation of alters affects ego's network centrality. We found that intrinsic motivation of alters is positively related to ego's indegree centrality, whereas the relationship between extrinsic motivation of alters and ego's indegree centrality is negative. These findings have important theoretical implications for the organizational network research, as it provides key insights for the micro-foundations of personality literature in contexts of social networks (Kilduff and Brass, 2010; Tasselli et al., 2015). Whereas the traditional research has examined the personal characteristics of an ego, and its relation with ego's network position (Mehra et al., 2001; Klien et al., 2004), we shed light on the characteristics of others as a predictor of ego's network position. With this, we show that individual position within a network structure depends from the motivational orientation of the imminent social neighborhood, beyond and above the motivational orientation of the focal actor. Our findings thus, reveal that individual characteristics at a higher level (i.e., the motivational orientation of the alters from whom the ego sought advice) affect focal actors' positions within a social structure.

Limitations and future research

The first potential limitation of the present study is that we didn't measure directly the perceptions of alters about the work motivation of a focal actor. We grounded our hypotheses about the attractiveness of the focal actor as a potential advice provider, as a function of expected value and cost for asking advice (Bamberger, 2009). We argued that the alters will perceive the

focal actor's work motivation, and on bases on these perceptions, they will form expectations about the quality of the advice, quality of the relationship as well as the accessibility, and willingness of the focal actor to meet the requests raised by the advice seekers. Although such an approach is well rooted in organizational literature (see also Erdogan et al., 2015), we make a call for future research to incorporate the perceptions of others in their research designs. Thus, the future studies may use more altercentric approach for understanding how the alters essentially perceive the work motivation, or other personal characteristics of the focal actor. A solid starting point can be the study of Kleinbaum et al. (2015), who investigated how the alters' perceptions about the focal actor's personality moderates the relationship between self-monitoring personality and structural position. Specifically, they found that high self-monitors, who were perceived by their alters as empathetic (i.e., able to understand other people's feelings and thoughts) were more likely to occupy brokerage position in a network. A straightforward implication of such an altercentric research design to the theory revealed in our study would be considering the alters' perceptions about the ego's work motivation. Future studies can thus, explore if the relationship between work motivation and indegree centrality will vary across the levels of alters' perceptions about the ego's work motivation. It can be that an individual with high level of intrinsic motivation will be more likely to become central if he or she is actually perceived by the alters as an individual with high level of intrinsic motivation. Although the experimental study of Wild et al. (1999) shows that an intrinsically motivated subject emits the enjoyment, challenge, and curiosity for the tasks at hand to the other members in his or her imminent environment, to the best of our knowledge, there are no studies that operationalized such perceptions in their research designs.

The second limitation of the present paper is the potential endogeneity between work motivation and network centrality. In an attempt to minimize this, we controlled for self-

monitoring personality as a key individual characteristic that may affect indegree centrality (Mehra et al., 2001; Oh and Kilduff, 2008). Moreover, we kept constant the employees' job performance, which can potentially confound our relationship of interest (Sparrowe et al., 2001). However, we make a call for future studies that may apply longitudinal research methods to investigate further the potential for a reverse causality in the relationship between work motivation and network centrality. Although the empirical analysis in this paper uses cross-sectional data, which is in line with the conventional approaches widely applied in organizational research (e.g. Erdogan et al., 2015; Oh and Kilduff, 2008), we believe that the organizational literature will benefit from empirical evidence about the effect of work motivation on centrality across time. Understanding this, could have important implications for the HRM literature. Taking into consideration the newcomers in a company, who are more inclined to seek rather than provide work-related advice (Carboni and Ehrlich, 2013), we may expect that newcomers will be less central in an organizational social network when they enter the company, in Time 1. The HRM practitioners thus, may be interested to know if an intrinsically motivated newcomer, who at Time 1 was less central will become more central in Time 2.

Finally, an interesting extension of our study is the possibility to consider the impact of alters' perceptions about ego's prosocial motivation. Grant and Berry (2011) have argued that prosocial motivation—the desire to benefit others—strengthens the relationship between intrinsic motivation and creativity. Despite of the fact that Grant and Berry (2011) do not study their phenomena of interest from a social network perspective, it will be interesting to explore a possible mediating effect of prosocial motivation on the relationship between intrinsic motivation and ego's indegree centrality. Indeed, as Grant (2013) has argued, prosaically motivated individuals are more likely to develop stronger relationships with the alters. Therefore, it can be tested in future studies

if prosocial motivation represents a psychological mechanism that explain the relationship between intrinsic motivation and ego's indegree centrality. Complementary to this, but taking an altercentric perspective, future research may explore the alters' perceptions about ego's prosocial motivation, and how these perceptions are reflected in the relationship between work motivation and indegree centrality.

Practical implications

This study offers important practical implications for managers in organizations, where the informal exchange of information and knowledge plays an important role. Our findings suggest that it is intrinsic rather than extrinsic motivation that leads individual to advantageous positions in networks where such exchanges take place. Therefore, the managers can use the Amabile's (1994) work preference inventory to determine the motivational orientation of the potential newcomers. Since intrinsically motivated individuals are more likely to become central, selecting and recruiting intrinsically motivated employees will stimulate the interpersonal interaction and the informal exchange of resources such as knowledge and information among the employees. Similarly, if an organization struggle to enhance the informal interaction among the employees, the extrinsically motivated employees should be encouraged to interact with intrinsically motivated coworkers. As our study suggests, seeking advice from intrinsically motivated individuals increases the likelihood that the advice seeker will become more central figure in a network. Another practical implication regards creating work context that stimulate the intrinsic motivation of employees. For example, Dimmock et al. (2012) have found that task variety increases the feelings of enjoyment and interest for the job, thus stimulating employees' intrinsic motivation. Consequently, organizations interested in enhancing the intrinsic motivation of their employees may consider designing complex jobs that consist of multiple, differing tasks.

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3. Paper II: Providing work-related advice to many co-workers as a mediator in the relationship between intrinsic motivation and innovative behaviour

Abstract

Drawing on the social network perspective, our aim in this study is to demonstrate that beyond the psychological mechanisms, intrinsic motivation is associated with innovative behaviour via the structural position that intrinsically motivated individuals obtain in a network of informal advice relationships. We argue that employees form positive expectations in terms of the quality of advice and the quality of the relationship that can be obtained by interacting with peers possessing higher levels of intrinsic motivation, thus increasing the likelihood that intrinsically motivated employees will be indeed, asked for advice by many peers. Providing work-related advice many co-workers, in turn, allows intrinsically motivated individuals to increase their competences as well as to broaden the perspectives, which are essential factors for coming up with novel and useful ideas. We have tested our hypothesis in an organizational setting, where the employees are encouraged, and rewarded when pursuing innovative behaviours. The results confirmed our hypothesis that intrinsic motivation increases the likelihood for being asked for advice, which in turn, enhances individual's innovative behaviour. The implications for the theory and practice, as well as the potential limitations are comprehensively discussed.

INTRODUCTION

Innovative behaviour of employees allows organizations to innovate products, services, and processes, which, as it has been argued, is crucial for gaining competitive advantage in an increasingly dynamic environment (Amabile, 1996; Chen and Kaufman, 2008; Ford and Gioia, 1995). Correspondingly, the research has devoted a considerable attention in studying the psychological and contextual factors that enable individual's innovative behaviour (Amabile et al., 2005; Carnabuci and Dioszegi, 2015; Grant and Berry, 2011; Oldham and Cummings, 1996; Perry-Smith, 2006).

From a psychological perspective, it has been shown that work motivation, and particularly, intrinsic motivation, is a key predictor of an enhanced innovative behaviour at work (Amabile, 1983; 1985; 1996; Bammens, 2016; Grant and Berry, 2011; Messmann and Mulder, 2014). The psychologists have drawn from the self-determination and positive emotions theories to provide mechanisms that explain this relationship (Amabile, et al., 2005; Gagnè and Deci, 2005). These psychological mechanisms imply that intrinsically motivated individuals engage in work-related activities because of interest, curiosity and a desire to learn about the tasks at hand (Ryan and Deci, 2000). Accordingly, intrinsic motivation is deemed to explain a considerable proportion of variance in individuals' innovative behaviour by increasing the cognitive flexibility, positive affect, risk-taking, and persistence (Shalley et al., 2004).

From a social network perspective, on the other hand, organizational network scholars have argued that social structure, where individuals are embedded, also plays an important role in predicting innovative behaviour (Perry-Smith and Mannucci, 2015; Perry-Smith and Shalley, 2003). This line of inquiry has emphasized the importance of opportunities for accessing valuable

assets such as information, and knowledge, which are available to individuals situated in advantageous positions within organizational networks of advice relationships (Sparrowe et al., 2001).

In order to enhance our understanding on innovative behaviour in organizational contexts, the extant research has only recently made attempts to integrate the psychological and social network perspectives (Baer, 2010; Fang et al., 2015; Zhou et al., 2009). Still, the micro-level motivational processes that lead to advantageous network positions have been largely overlooked (Tasselli et al., 2015). Indeed, the organizational network research has for long considered the motivation and opportunity “as one and the same” (Burt, 1992: 36). A straightforward implication of this assumption is that positions occupied by employees in the informal organizational networks of advice relationships are not influenced by the level of motivation. Interestingly, the scholarship on social psychology of creativity, which has intrinsic motivation in its essence (Amabile and Pillemer, 2012), has studied how environmental conditions may affect creativity through its influences on intrinsic motivation (Amabile et al., 1996; Malik et al., 2015). However, the role of agency has been largely neglected, and it remains unclear whether, and how intrinsically motivated individuals may shape their imminent social environment, which in turn, can help them achieve better performance-related outcomes. The answer to this question may have important theoretical and practical implications, and our objective in this study is to provide a solution to this research problem.

To do so, we offer a promising conceptual framework and empirical results that integrate the personal psychology and social network perspectives. We suggest that beyond, and above psychological mechanisms, there is a structural mechanism that explain the relationship between intrinsic motivation and innovative behavior. From a social psychology perspective, it has been

argued that individuals form positive expectations in terms of quality of the relationship and quality of advice that can be obtained by interacting with peers possessing higher levels of intrinsic motivation (Wild et al., 1997). Consistent with this, but taking a social network perspective, we argue that individuals with higher level of intrinsic motivation are more likely to be asked for advice by their colleagues, thus acquiring advantageous network positions within organizational networks of advice relationships. Having the opportunity to provide advice to many colleagues, the intrinsically motivated individuals can learn about other people's experiences and problems (Brown and Duguid, 1991; Elkjaer, 2003). Thus, we argue that providing work-related advice, operationalized as in-degree centrality in organizational networks, will mediate the relationships between intrinsic motivation and innovative behaviour. Our argument that providing work-related advice is beneficial for innovative behaviour is in line with the recent study of Shah et al. (2015), who have found that providing problem-solving assistance is positively associated with work-related performance. Building on these findings, we broaden the knowledge on the effects of providing resources via the interpersonal ties on performance-related outcomes. In respect to the study of Shah and colleagues (2015), we focus on a prosocial behaviour that is broader in scope than providing problem-solving assistance. Indeed, problem-solving assistance is likely to be one of the dimensions nested in work-related advice (Brief and Motowidlo, 1986). Importantly, our decision to operationalize providing work-related advice as in-degree centrality is consistent with the findings from the meta-analysis conducted by Fang et al. (2015), which demonstrate that in-degree centrality, rather than brokerage, has stronger association with performance-related outcomes. Moreover, assuming that intrinsic motivation is an enduring personal characteristic across different contexts (Amabile et al., 1994; Ryan and Deci, 2000), the proposed theoretical framework is in line with the suggestions provided by Fang and colleagues (2015), who have

shown that network positions, and in particular, in-degree centrality, partially mediated the effects of various personality traits on several performance-related outcomes.

Our study makes important theoretical contributions for our knowledge on motivation, organizational networks, and innovative behaviour. First, by showing that intrinsic motivation affects the structural position of an individual within a network of advice relationships, the present paper contributes to the literature on micro-foundations of organizational networks. With this, we respond to Tasselli's et al. (2015) recent call for future research, who argued that management scholarship still lacks knowledge on whether, and how individual differences in terms of motivation, enact different social networks. Second, we contribute to the recent debate within the organizational network research about the utility of interpersonal ties. In the last decade, the scholars have grounded their hypotheses on the assumption that an individual engages into social relationships in order to get access to, or receive valuable resources (Kilduff and Brass, 2010; McFadyen and Cannella, 2004). The extent to which an individual may enhance his or her innovative behaviour by providing valuable resources, such as advice on work-related issues to other organizational members, has been largely overlooked (Shah et al., 2015). Third, our study makes an important contribution to organizational creativity literature, which has for long mirrored the creativity literature in general psychology to understand the relationship between intrinsic motivation and innovative behavior (Hennessey and Amabile, 2010; Shalley and Perry-Smith, 2001; Grant and Berry, 2011). The present study does not neglect the well-established psychological mechanisms proposed by self-determination and emotion theories in general psychology. Instead, we shed new light on the relationship between intrinsic motivation and innovative behaviour by suggesting that beyond, and above the psychological mechanisms, the

structural position within social network that allows an individual to provide work-related advice, is an important mechanism as well.

THEORY AND HYPOTHESES

Innovative behaviour defined

Relatively narrow boundaries for the concept of individual creativity and innovation are provided by scholars who focus on creativity, who have referred to it as a process involving generation of ideas that are at the same time novel and useful within a particular context (e.g. Amabile, 1988; Oldham and Cummings, 1996). Pointing out that that this definition overlooks the aspect of implementation, researchers have broadened the meaning of the concept such that it entails two stages, that is, creativity as a first stage, and idea implementation as a subsequent stage of the entire process (Amabile, 1996; Shalley and Zhou, 2008). Idea implementation here refers to evaluation of the generated ideas, putting them into practice, and incorporating them within the established organizational practices (Gilson and Shalley, 2004). Finally, in an attempt to provide a comprehensive conceptualization of this, nonetheless complex process, Janssen (2000; 2001) decomposed the process into three distinguishable stages, that is, idea generation, idea promotion, and idea implementation. According to this distinction, the mid-process of idea-promotion refers to mobilizing support, acquiring approval and making the important organizational actors enthusiastic about the generated ideas.

Although many scholars studying the effects of intrinsic motivation on individual creativity and innovation have used the term ‘creativity’ (e.g. Amabile, 1985; Shalley and Perry-Smith, 2001; Dewett, 2007), we are inclined to believe that creativity (i.e., idea generation), if not followed by

the subsequent stages that aim at ultimately putting an idea into practice, has slight organizational value. As Levitt (1963: 79) suggested, “ideas are useless until used”. Hence, consistent with the work done by Janssen (2000; 2001), Scott and Bruce (1994) as well as Yuan and Woodman (2010), in this study, we use the term ‘innovative behaviour’ to denote a complex process that involves individual engagement into activities pertaining at idea generation, idea promotion, and idea implementation.

The baseline hypothesis: Intrinsic motivation as a predictor of innovative behaviour

Intrinsic motivation can be defined as an enduring personal trait that depict the extent to which individuals “engage in work primarily for its own sake, because the work itself is interesting, engaging, or in some way satisfying” (Amabile et al., 1994: 950). Characterized with such perceptions about the motives for their work-related actions, intrinsically motivated people will learn thoughtfully about the work activities in which they are involved, and will increase their knowledge needed for successfully bringing an idea throughout the three stages of an innovative process (Ryan and Deci, 2000).

Recognizing that intrinsic motivation is an important antecedent of individual creativity and innovation (e.g. Amabile, 1996; Grant and Berry, 2011), the extant literature has identified three major, highly interrelated, psychological mechanisms that explain this relationship (Grant and Berry, 2011). The first, has been proposed by self-determination theorists, who assume that individuals have different perceptions about the causes of their own behaviour (Deci and Ryan, 1985a, 1985b; Ryan and Deci, 2000). Rather than acting for the sake of factors that are external to the task at hand (e.g. rewards, incentives, status and/or reputation), intrinsically motivated individuals perceive their engagement in a work-related activity as being elicited by their own

interest and curiosity for the activity itself (Amabile et al., 1994; Deci and Ryan, 1985a). Because of this convergence between one's own personal values from one, and the actual engagement in activities, which resemble those values from the other hand, intrinsically motivated individuals are said to "act for fun or challenge entitled rather than because of external prods, pressures, or rewards" (Ryan and Deci, 2000: 56). Driven by their interest and curiosity to learn, it has been consistently shown that intrinsically motivated individuals have an enhanced cognitive flexibility, and conceptual understanding (Gagné and Deci, 2005); are more likely to engage actively in work-related activities (Messmann and Mulder, 2014); and are prompt to take more risks (Dewett, 2007), which in turn, are fundamental factors for an enhanced innovative behaviour (cf. Amabile, 1983; 1996).

The second psychological mechanism has been proposed by emotion theorists and regards positive affect that intrinsically motivated people experience while performing tasks (Gagné, 2003; Isen and Reeve, 2005; Silvia, 2008; Vandercammen et al., 2014). The positive emotions such as enjoyment, satisfaction and challenge that result from engaging in work-related activities for sake of one's own interest and curiosity, systematically influence the number, as well as the breadth of cognitive elements available to an intrinsically motivated individual for association and combination (Isen and Reeve, 2005). Alike the mechanisms provided by self-determination theory, the theory of positive affect suggests that intrinsic motivation affects innovative behaviour by influencing individual's cognitive flexibility needed for organizing ideas in a novel and appropriate way (Amabile et al., 2005; Ashby et al., 1999; Isen et al., 1987). The focus of emotion theorists is thus, not on the causational orientation of an individual (i.e. the focus of self-determination theory) but on how the emotions of positive affect experienced by intrinsically motivated individuals allow them to acquire the necessary psychological resources for energizing

themselves, and considering various alternatives while performing work-related tasks, which are yet again, essential requirements for coming up, promoting, and implementing novel ideas.

The third psychological mechanism, suggested by both self-determination and emotion theorists, regards the persistence that characterizes intrinsically motivated individuals while pursuing work-related activities (Grant and Berry, 2011). Driven by interest and curiosity for the work itself, according to the self-determination theory, intrinsically motivated individuals are more likely to be relatively persistent while performing complex, work-related activities (e.g. Deci and Ryan, 2008; Gagné and Deci, 2005). The emotion theorists instead, suggest that emotions such as enjoyment, challenge, and satisfaction, which are associated with intrinsic motivation, affect innovative behaviour by increasing the time, effort, and attention that intrinsically motivated people are willing to commit at their work (e.g. Erez and Isen, 2002; Fredrickson, 1998).

Following these well-established psychological mechanisms, we provide our base-line hypothesis, formally stated as:

H1: Intrinsic motivation is positively associated with innovative behaviour.

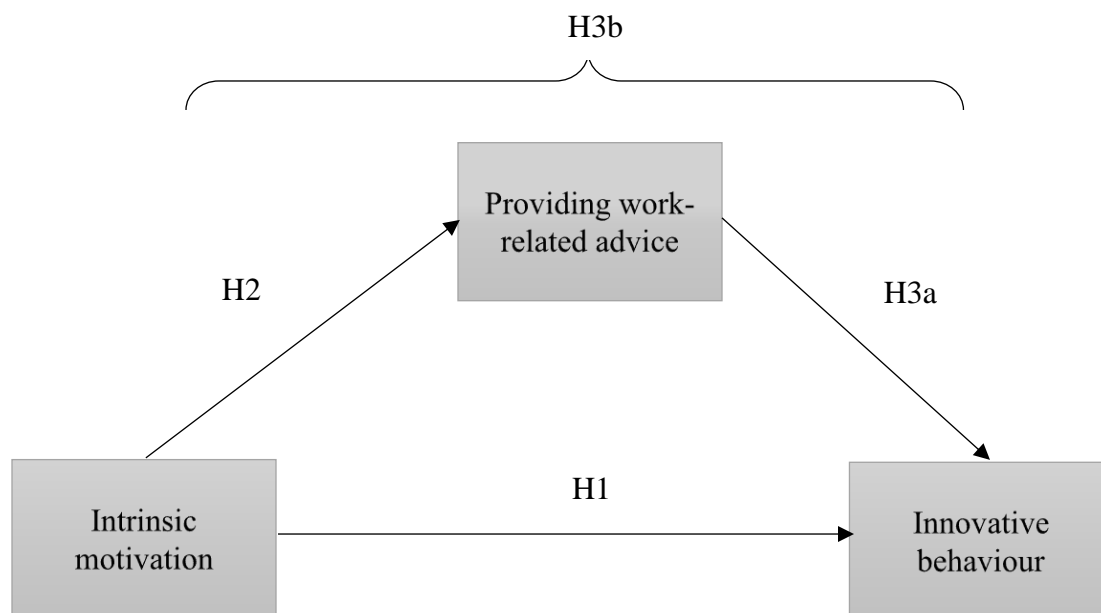
The role of providing work-related advice

In the current research, the emphasis is on understanding the relationship between intrinsic motivation and innovative behaviour, above and beyond the psychological mechanisms suggested by the self-determination and emotions theories. For this purpose, we focus on the informal advice ties as a foundation for setting a new, structural mechanism. As we have noted above, informal advice relationships provide the employees with opportunities to exchange important organizational resources such as knowledge, information, assistance, and guidance (Sparrowe et al., 2001). Hence, we investigate the micro-level motivational processes that enable employees to

acquire advantageous position within the organizational networks of advice relationships. The organizational network research has indeed, demonstrated that the number of people with whom an individual interacts is beneficial for innovative behaviour (Perry-Smith, 2006; Perry-Smith and Shalley, 2003), and work-related performance, in general (Cross and Cummings, 2004).

However, this literature stream has grounded its hypothesis on the assumption that individuals build larger networks in order to receive valuable benefits (McFadyen and Cannella, 2004). Concurrently, scholarship outside the network research has shown that engagement in prosocial behaviours, that is, providing help, assistance, or other kinds of work- or personal-related support to other people (see Brief and Motowidlo, 1986; for definitions of different kinds of prosocial behaviours), may bring various benefits to the providers. Consistent with this line of reasoning, we show that providing, rather than receiving advice, is beneficial for innovative behaviour. The proposed model and the hypothesized relations are illustrated in Figure I below.

Figure 1: Summary of hypotheses



Intrinsic motivation and providing work-related advice. We argue that there are three basic postulates reflecting the perceptions, and the corresponding expectations that an advice seeker will take into consideration when deciding his or her advice providers: i) quality of the advice that can be potentially obtained; ii) quality of the relationship with the potential advice provider; and iii) accessibility, and willingness of the advice provider to meet the requests of the advice seeker. We note that there is not a hierarchical order of the proposed theoretical postulates, on which we base our hypothesis about the relationship between intrinsic motivation and providing work-related advice. Instead, they are all equally important determinants of a rational advice-seeking decision.

First, the quality of advice that can be potentially obtained from an advice provider is a key postulate on which every advice-seeking decision will be based. The underlying assumption here is that employees will tend to interact with those co-workers who, according to their expectations, will allow them having access to valuable organizational assets (Porter & Woo, 2015). Interpreting this assumption in a context of an informal organizational network of advice relationships implies that individuals will turn out for work-related advice to the co-workers, who are expected to provide the highest quality advice. The social capital theory (Adler & Kwon, 2002; Nahapiet & Ghoshal, 1998), as one of the most influential theories for studying the emergence of interpersonal ties, posits that the main instrumental motive for individuals to engage in advice relationships is having access to valuable resources such as knowledge and information that are inherent in these relationships (Brass & Burkhardt, 1993; Phelps, Heidl, & Wadhwa, 2012). Since the main purpose for engaging in advice relationships is obtaining access to information and knowledge, the advice seekers will be moved to form ties with those individuals who, according to their perceptions, possess the most adequate knowledge and information about the tasks at hand (Agneessens & Wittek, 2012; Bonaccio & Dalal, 2006). In a similar manner, the information seeking model

proposed by Borgatti and Cross (2003), suggests that the probability that an individual will seek advice from another person depends on the perceptions about another's person expertise and skills. Driven by interest and curiosity for the work itself, intrinsically motivated individuals are likely to apply relatively more efforts and demonstrate greater job involvement in comparison to individuals who are less intrinsically motivated (Grant, 2008; Dysvik & Kuvaas, 2013). By showing more persistence in work-related activities, intrinsically motivated employees will be actively involved in a process of continuous learning thus, enriching their pool of domain-relevant knowledge (Ryan & Deci, 2000). The organizational members involved in advice relationships, throughout repeated interpersonal interactions, will perceive the individual differences and form attitudes about the other members of the network (Salancik & Pfeffer, 1978). Being perceived as employees, who possess the relevant work-related knowledge and information, highly intrinsically motivated individuals will be preferred over other organizational members as desired sources of advice. Following this line of reasoning, we argue that intrinsically motivated individuals will be perceived by other organizational members as the ones that can provide the highest-quality information, knowledge, and expertise.

The quality of the relationship is the second postulate upon which, organizational members will base their decision regarding their potential advice providers. Deci and Ryan (1985a) have suggested for instance, that people engage into interpersonal relationships not only because of certain functional purposes (i.e., obtaining high-quality advice), but also as means for satisfying basic psychological needs such as the need for autonomy, competence, and relatedness. It has been shown that these psychological needs can be nurtured by engagement into high-quality interpersonal relationships through which a focal actor receives constructive feedback and support (Fernet, Gagnè, & Austin, 2010). Complementary to this, prior research has proposed that

intrinsically motivated individuals tend to behave in a way that systematically affect the basic psychological needs of the people in their imminent surrounding (Wild et al., 1997). In a model that links social perceptions, expectancy formation, and motivational orientation, Wild and colleagues argued that by perceiving others as intrinsically motivated, a focal actor forms expectations that the interpersonal relation with the perceived actor will be of a greater quality, and that the task engagement will be followed by feelings of pleasure and enjoyment (Wild et al., 1997). The interaction with intrinsically motivated individuals thus, enacts the basic psychological needs of the advice seeker. Beyond the perceived quality of advice that can be obtained by interacting with an intrinsically motivated individual, the organizational members will expect that the relationship itself, and their engagement in the task will be of relatively higher quality when asking advice from an intrinsically motivated colleague. Therefore, intrinsically motivated employees are likely to become ‘magnets’ for advice requests by their co-workers.

The accessibility, and willingness of the advice provider to meet the requests of the advice seeker is the third postulate on which individuals will decide from whom they should turn out for work-related advice. Indeed, being perceived as a reference point for advice seeking, does not necessarily imply that the intrinsically motivated employees will eventually provide the requested advice. By examining the conditions under which intrinsic motivation is associated with innovative behaviour, Grant and Berry (2011) have shown that intrinsic motivation is positively associated with prosocial motivation. An individual with higher level of intrinsic motivation is likely to engage in prosocial behaviours such as providing work-related advice. This reasoning is in line with the self-determination theory, which posits that by engaging in prosocial behaviours, intrinsically motivated individuals experience greater vitality, well-being and self-esteem because of the satisfaction of their basic psychological needs for autonomy, competence and relatedness

(Weinstein & Ryan, 2010). Similarly, the knowledge sharing literature proposes that intrinsic motivation is a solid predictor of tacit knowledge sharing (Jeon et al., 2011; Ozlati, 2015). The positive feelings such as enjoyment and challenge in solving complex problems are deeply rooted in intrinsically motivated individuals (Amabile, 1997) and therefore, they would not need additional triggers to share the knowledge and expertise with other organizational members (Ryan and Deci, 2000). That is to say, beyond being frequently sought for advice, intrinsically motivated employees will be motivated to respond affirmatively to advice requests. The accessibility of individuals with high intrinsic motivation, and their willingness to share advice will be recognized by the other organizational members, who in turn, will frequently seek advice from individuals with higher level of intrinsic motivation.

Summing up, we argue that the decision to seek advice will be based on the quality of advice itself, the perceived quality of the relationship with the potential advice providers, as well as the accessibility of a person to provide advice, and his or her willingness to share information, knowledge, and expertise with the advice seeker. Our theory suggests that organizational members have sound reasons to detect the co-workers with higher level of intrinsic motivation over the co-workers with lower level of intrinsic motivation as potential advice providers in an informal organizational network. Taking into consideration all the arguments, we hypothesize that:

H2: Intrinsic motivation is positively related to providing work-related advice (i.e. in-degree centrality in the informal organizational networks of advice relationships).

Providing work-related advice and innovative behaviour. Engagement in work-related advice relationships provides the organizational members with resources such as knowledge, information

and experience that can be applied for successful problem solving and learning (Cross and Parker, 2004). As the constructivist learning theorists suggest, the exchange of these resources among employees is not one directional (Brown and Duguid, 1991; Elkjaer, 2003). Thus, when a focal employee provides work-related advice, the resources are not simply transmitted to the recipient, but they flow in both ways (Elkjaer, 2003). Frequent exposure to such combination and re-combination of resources is indeed, the hallmark of individual creativity and innovation (Mors, 2010; Rodan and Galunic, 2004).

We suggest that being sought for advice by many people within a network of advice relationships, provides opportunities for learning, which in turn, enhances one's own performance throughout the three stages of innovative behaviour. Thus, by being involved in an active discussion with peers that have turned out for advice, the advice provider will have the opportunity to gain, but also to combine and recombine new knowledge (Singh et al., 2016), which is vital for successful generation of novel ideas (Fleming, 2001). For example, it has been argued that engagement in a productive face-to-face dialogue promotes individuals' abilities to draw distinctions about tasks at hand through a process of conceptual combination, expansion, and reframing (Tsoukas, 2009). This new knowledge on the analogies and differences between one's own tasks at hand and the tasks held by the advice seekers, would enable advice providers to select and implement solutions for their own work-related issues that were applied elsewhere (Hargadon, 1999). Hence, advice providers will have an advantageous position to learn about how to reframe their own work-related issues and to come up with novel and useful ideas. As Amabile (1983) have suggested, creativity rests on the individual's cognitive flexibility for combination of otherwise disparate elements in a novel way, which requires learning aimed at broadening one's own perspectives and interests.

Moreover, by engaging into an intensive interaction with colleagues who seek advice, advice providers will have an opportunity to obtain valuable feedback about how to advance and improve their own ideas and solutions (Franke and Shah, 2003). Having taken into consideration the opinions of others in the development of their own ideas and solutions, advice providers will obtain important insights about the potential usefulness of the novel ideas. Thus, through a process of collaborative filtering and selection, advice providers will be in an advantageous position to promote, convince, and make important organizational members enthusiastic about their ideas and solutions (Perry-Smith and Shalley, 2003).

As far as the implementation stage is concerned, it has been suggested that the interaction with colleagues allows an individual to gain access to tacit knowledge, which is fundamental for a successful implementation of novel ideas (Polanyi, 1966). Since this kind of knowledge is exchanged by direct, rather than indirect interaction with peers (Nonaka, 1994), providing advice would enable a focal employee to better understand contextual cues (cf. Wilensky, 1967). Indeed, possessing knowledge about the context where an idea should be potentially put into practice is essential for a successful implementation of novel ideas (Gilson and Shalley, 2004).

Taking into consideration the learning benefits from providing advice, and the empirical evidence suggesting that network size should amplify these benefits (e.g. Arifovic et al, 2015), we would expect the following:

H3a: Providing work-related advice is positively associated with innovative behaviour.

Hypotheses 1 and 2 suggest that the link between intrinsic motivation and employee innovative behaviour is partially mediated by providing work-related advice. Past literature has

theorized a set of psychological mechanisms by which intrinsic motivation affects innovative behaviour. The proposed model did not neglect those psychological mechanisms, but instead, reveals an alternative path through which higher levels of intrinsic motivation increase employees' ability to create, promote and implement novel ideas within the organization. Specifically, we argue that part of the observed empirical association between intrinsic motivation and innovative behaviour occurs through a structural mechanism: intrinsically motivated employees are more likely to be frequently asked for advice by their colleagues and holding such an advantageous network position independently facilitates innovate behaviour. These arguments lead us to the following hypothesis.

H3b: Providing work-related advice will partially mediate the relationship between intrinsic motivation and innovative behaviour.

METHODS

Empirical setting and data collection

We tested our theory in a small service company, headquartered in the northern Italian region of Lombardy. In this study, we dubbed the company as ItalEnergy in order to preserve anonymity. Founded in 2008, ItalEnergy in relatively short time span became one of the leading companies in the Italian energy market, providing its clients with innovative customized solutions for optimizing energy consumption. The clients' portfolio comprises large scale energy users such as manufacturing and service companies, public authorities, consumer associations and utility companies. The interviews conducted with the upper management on the beginning of our

fieldwork, suggest that satisfying the differing customer needs in such a diversified client portfolio requires employees' engagement into the three stages of innovative behaviour, which ItalEnergy actively encourages and rewards. Moreover, the interviewed managers have argued that ItalEnergy nurtures collaborative culture, where informal interpersonal ties are valued as important means for knowledge sharing and individual performance. Therefore, we believe that ItalEnergy is an appropriate empirical setting for testing our hypothesis that social network position acquired through providing informal work-related advice will mediate the relationship between intrinsic motivation, as a personal characteristic, and innovative behaviour.

Our sample comprises the entire organization, amounting to a total of 134 employees. Indeed, several recent studies that have analysed complete social networks have drawn their empirical data from samples of similar size (e.g. Zhou et al., 2009; Wang et al., 2015). In order to avoid common biases, we have collected the data by distributing our questionnaires in two different waves. It is important to stress that, given the macro context in which the study was conducted, we have administered both questionnaires in Italian language. First, we have sent, via email, an URL link of the on-line survey to all 134 employees of ItalEnergy, aiming to obtain network, as well as personal characteristics data. From a total of 134 employees, 128 people participated in the on-line survey, allowing us to obtain a response rate of 96%. Second, two weeks after completion of the on-line survey, we have administered the second questionnaire to all the supervisors of the company (31 supervisors), asking them to respond to statements regarding innovative behaviour of their subordinates. Thirty of them responded affirmatively, providing the requested assessment of subordinates' innovative behaviour. Taking in consideration the missing data from both questionnaires, 120 employees, or 90% were included in the data analysis. From

those that have participated, it appears that an average ItalEnergy's employee is a 33.9 years old male (63% males), holds a Master's degree and has been with the company for 2.20 years.

We have collected our network data through a "roster method", which is a useful instrument for social network data collection aimed at decreasing the cognitive efforts of the respondents when selecting their contacts (Carnabuci and Dioszegi, 2015). Thus, every ItalEnergy's employee was provided with a list of all other colleagues, from which a respondent was able to scroll and choose his or her contacts by ticking on a box that appeared next to the names. In order to reduce measurement error, we have not imposed restrictions on the number of contacts that could be nominated by a respondent (Wong, 2008).

The proposed structural mechanism, which we argue, explains part of the relationship between intrinsic motivation and innovative behaviour is based on the informal organizational advice relationships. Past research has indeed found that these relationships are important sources of valuable organizational assets such knowledge, information, assistance and guidance (Sparrowe et al., 2001), and therefore, are fundamental for getting work done in organizations (Shah et al., 2015). In order to capture ItalEnergy's network of intraorganizational advice relationships we have phrased the question, preceded by an introductory statement, as following: "When faced with work-related issues and problems the people could turn to their colleagues and/or supervisors for asking advice. Looking back at the last year, to whom of your colleagues do you turn to for advice in professional, technical, or work-related matters?" For the selected contacts, the respondents were requested to report frequency of advice seeking, and for this purpose, we asked the following question: "How often do you turn to this colleague for advice?" The provided answers were: "At least once a week"; "At least once a month" and "Less than once a month".

The number of contacts nominated by a person ranged from 1 to 35 colleagues, and on average, an employee has turned out for advice to 6.66 colleagues ($sd = 6.61$). Considering the lower ranked employees (i.e., the ones without a supervisory role that are 77% of the entire sample), 63.04% of the nominated contacts were at a lateral hierarchical level, and 60.37% spanned the departmental boundaries. These statistics confirm management's statement revealed during the preliminary interviews that the informal relationships are an important part of ItalEnergy's working environment.

Measures

Innovative behaviour. We measured innovative behaviour using the original 9-items scale developed by Janssen (2000, 2001). The scale measures innovative behaviour as a three-dimensional construct, involving idea generation, idea promotion and idea implementation. In order to avoid possible shortcomings in terms of common method bias that can occur in self-reported measures, we have followed the suggestions drawn by Anderson et al. (2014), who encouraged the scholars to use more objective, third-party assessments of innovative performance. Thus, we have sent the questionnaire, involving the nine items to 31 supervisors of the company who were asked to assess the innovative behaviour of their subordinates. Following Scott and Bruce (1994), the nine items were preceded by an introductory statement arguing that: "Innovation is a process involving generation, promotion, and implementation of ideas. As such, it requires a wide variety of specific behaviours on the part of individuals. While some people might be expected to exhibit all the behaviours involved in innovation, others may exhibit only one or a few types of behaviour". Sample items that followed the statement included "Searches out new working methods, techniques, or instruments" (idea generation), "Acquires approval for

innovative ideas” (idea promotion), and “Evaluates the utility of innovative ideas” (idea implementation). The response format was a scale that ranged from 1 “Strongly disagree” to 8 “Strongly agree”. If not differently stated, such a format was used for all the scales in this study.

Similar to the study of Janssen (2000), we found relatively high intercorrelations between the three different dimensions of innovative behaviour, which in this study ranged from 0.65 (idea promotion and idea implementation) to 0.79 (idea generation and idea implementation). Because of the high intercorrelatedness between the three dimensions, we created our dependent variable as a sum of all responses that ranged from a theoretical minimum of 9 to a theoretical maximum of 72. Cronbach’s alpha was 0.94.

Intrinsic motivation. ItalEnergy employees completed the 15-items intrinsic motivation scale, originally developed by Amabile et al. (1994). Amabile and colleagues have validated the scale using samples of working adults as well as student undergraduates. The same participants who have been surveyed in several waves have reported relatively stable scores, thus confirming the assumption that intrinsic motivation is an enduring individual characteristic (Amabile et al., 1994). Sample items included “The more difficult the problem, the more I enjoy to solve it”, and “I prefer to figure things out for myself”. Cronbach’s alpha was 0.70.

Providing work-related advice. We measured the extent to which employees are sought out for work-related advice by counting the number of nominations they have received from their colleagues (i.e. in-degree centrality in social networks). We have excluded from consideration the possible advice seeking ties directed toward supervisors. Thus, if a supervisor has been nominated as a source of advice by his or her direct subordinate(s), that tie(s) was/were not counted in the

supervisor's in-degree centrality. We took this decision in order to minimize the noise from the formal reporting that might be mirrored in the self-reported informal organizational advice relationships (Oh et al., 2006).

Control variables. We controlled for a number of demographic, contextual and personal characteristics variables that could be expected to influence our estimates of interest. Demographic variables that we took in consideration include *age*, *gender*, and *level of education*. We controlled for age because research has shown that younger employees tend to receive higher performance evaluation from their supervisors (Alessandri and Borgogni, 2015). Controlling for gender is important because it may affect creativity (Chavez-Eakle et al., 2006), job performance, in general (Roth et al., 2012), and the access to resources embedded in the informal organizational relationships (Ibarra, 1993). In this study, gender was a dummy variable, where 0 is “female” and 1 is “male”. Lastly, we included the level of education because higher level of education has been associated with greater creativity and job performance (Ng and Feldman, 2009). Emulating the Italian higher education system, the level of education variable ranged from 1 to 4, where 1 = High school diploma, 2 = Bachelor's degree (three years), 3 = Bachelor's degree (3 years) + post-graduate specialization (2 years) or post-secondary academic degree, according to the old Italian system of higher education (4 years), and 4 = Master's degree or higher.

Regarding the contextual variables, we controlled for *job tenure*, *hierarchical position*, and *supervisors' span of control*. We kept job tenure constant in our models because research has found that the years spend within a particular occupation may affect intrinsic motivation (Amabile et al., 1994), and innovative behaviour (Ng and Feldman, 2013). Moreover, longer job tenure may create opportunities for developing more social relationships with the colleagues (Nonaka, 1994).

Hierarchical position was included as the prior research has shown that it may relate to social network position and performance (Ibarra and Andrews, 1993). The variable, in our study, ranged from 1 to 4 in an ascending order, where 1 = employees without supervisory roles, 2 = middle managers, 3 = the upper management, and 4 = the co-founders, including the CEO. In order to assure that our estimates of interest, and particularly our mediating variable is not affected by supervisors' span of control (Carnabuci and Dioszegi, 2015), we created a variable that measures the number of subordinates of each supervisor. The employees without supervisory roles were assigned a value of zero.

We have also controlled for two network variables, that is *number of friends*, and *out-degree centrality in advice relationships*. The extant research has shown that friendship ties at workplace are important sources of emotional support, which may lead to enhanced job performance (Hayton et al., 2012). Furthermore, intraorganizational friendship and advice ties may coevolve and affect each other (Rank et al., 2010). In order to account for these possible consequences that friendship ties may have on our estimates of interest, we collected data relative to the friendship relations in ItalEnergy. Applying the same approach that we used for collecting data on advice relationships, we used a roster method, asking each employee to select the contacts that he or she considers friends. Specifically, we asked the following question: "Considering all the employees in ItalEnergy, please indicate the colleagues you regard as your friends". In an attempt to clearly distinguish the friendship ties from the advice seeking ties, the question was followed with a statement stating: "You may decide to repeat or not some of the persons selected in the previous question". Indeed, the previous question regarded the work-related advice relations. We did not impose any restrictions on the number of friends that can be selected, and for each contact nominated as a friendship tie, we asked the respondents about the strength of the

relationship followed by a response that ranged from “weak” to “very strong”. Following the provisions from prior research, we considered that two employees are friends only if they both have reported a friendship tie towards each other, that is, we considered only the reciprocated friendship ties (Balkundi et al., 2007).

Drawing on the principle of reciprocity, which is one of the hallmarks of social capital theory, research has found that people tend to reciprocate the advice relationships in organizational contexts (Agneessens and Wittek, 2011). Hence, the number of contacts that employees have reported as sources of work-related advice may affect the extent to which they are, in turn, sought out for advice. Moreover, because of the increased interaction with many others about work-related issues, which increases the opportunities to access the resources embedded in these relationships, the employees that have reported many advice relations may enhance their creative performance as well (Perry-Smith, 2006; Zhou et al., 2009). In order to control for these possible influences of the self-reported networking activity on our mediating and dependent variables, we calculated the number of advice ties reported by every employee, that is *out-degree centrality*.

The extant literature has argued that individuals scoring high on *self-monitoring* may attain favorable positions in social networks, which in turn may enhance their workplace performance (Mehra et al., 2001). Because of their ability to adopt the behaviour in response to different social situations in which they find themselves, high self-monitors tend to have larger networks of social relationships (Oh and Kilduff, 2008). Hence, for controlling the possible effects on network size and innovative behaviour, we have included the individual differences in this personal characteristic using the original 12-items scale developed by O’Cass (2000). The response format was a Likert scale that ranged from 1 “Strongly disagree” to 6 “Strongly agree”. Cronbach’s alpha was 0.84.

EMPIRICAL ANALYSES AND RESULTS

Data analysis strategy

In order to test our theorized mediation model, we conducted the Baron and Kenny's (1986) causal steps approach for mediation analysis. The causal steps approach draws information from the three regression equations:

$$Y = i_1 + cX + e_1 \quad \text{[Equation 1]}$$

$$Y = i_2 + c'X + bM + e_2 \quad \text{[Equation 2]}$$

$$M = i_3 + aX + e_3 \quad \text{[Equation 3]}$$

where, i_1 , i_2 , and i_3 are intercepts, Y is innovative behaviour, X is intrinsic motivation, M is providing work-related advice, c is regression coefficient that relates intrinsic motivation to innovative behaviour, c' is the regression coefficient that relates intrinsic motivation to innovative behaviour when controlling for the effect of providing work-related advice on innovative behaviour, b is the regression coefficient that relates providing work-related advice to innovative behaviour when controlling for the effect of intrinsic motivation on innovative behaviour, and a is the regression coefficient that relates intrinsic motivation to providing work-related advice. According to this multiple regression approach, four steps are required for establishing a mediation model. First, the independent variable should be significantly related to the dependent variable, that is, intrinsic motivation and innovative behaviour should be significantly related (regression coefficient c in Equation 1). Second, the independent variable needs to be significantly related to the mediating variable (regression coefficient a in Equation 3). Third, the relation between the

mediating and the dependent variable should be significant when both the independent and mediating variables are predicting the dependent variable (regression coefficient b in Equation 2). Fourth, the regression coefficient of the independent variable needs to be larger in a model where the mediator is absent in comparison to the model where the mediator is included (i.e. $c > c'$).

Although the causal steps approach is most widely used technique for testing the significance of a mediation model (Fritz and MacKinnon, 2007), we applied additional techniques to test for the statistical significance of the mediated effect (see for example, Mallinckrodt et al., 2006; Preacher and Kelley, 2011). Prior to discussing the results, however, we checked out for the presence of possible outliers that may affect the statistical inference of the proposed model. Indeed, we follow the recommendations provided by Aguinis et al. (2013), who have strongly suggested that scholars explicitly analyze and manage the outliers in a separate section.

Outlier detection and management

Following the suggestions provided by Aguinis et al. (2013) we conducted several tests to identify and handle possible outliers in our data, that is, cases that deviate markedly from other cases in the data set. First, we have applied single and multiple construct techniques in order to detect possible outliers in our dataset. Second, we have explored each of the identified cases separately, in order to determine if their location is caused by errors (i.e., inaccuracies such as data entry mistakes, coding errors and incorrect inclusion of some cases into the dataset) or by some valuable, and unexpected knowledge that may be hidden in these cases, that is, if the outliers can be defined as *interesting outliers* (Mohrman and Lawler, 2012). Third, we have investigated if our data contains cases that cannot be classified as error or interesting outliers, but could, however, affect our model fit and the estimated parameters.

In order to detect if our data contains outliers we have conducted both single construct and multiple construct techniques, as suggested by Aguinis et al. (2013). Regarding the single construct techniques, we have first investigated if our constructs of interest, that is, innovative behaviour, intrinsic motivation, and providing work-related advice, are normally distributed. It appears that only intrinsic motivation is normally distributed (Shapiro-Wilk, $p = 0.40$; Skewness, $p = 0.30$), while innovative behaviour is negatively skewed (Shapiro-Wilk, $p = 0.00$; Skewness, $p = 0.01$). It indicates that there are employees that have been assessed with relatively low scores on innovative behaviour, and thus, their location is on the far-left side of a frequency distribution. On contrary, the frequency distribution of our mediating variable is positively skewed (Shapiro-Wilk, $p = 0.00$; Skewness, $p = 0.00$), suggesting that there are employees that have been sought out for advice much more than an average employee of ItalEnergy. In order to investigate further for the presence of outliers in our three constructs of interest, we have performed percentage analysis to identify the cases that are positioned in the tails of the frequency distributions. It appears that there are no observations located in the bottom or top 2.5% in more than one construct.

Next, we applied multiple construct techniques to test if there are outliers based on the scores of predictors and/or outliers based on regression residuals scores (Aguinis et al., 2013). Concerning the outlyingness based on scores of predictors, we have calculated the leverage values for both the baseline (i.e. Equation 1) and mediation model (Equation 2), which had 10 and 11 predictors, respectively. We have set the cutoff point equal to $2(k + 1)/n$ for large sample size, where k is the number of predictors, and n is sample size (Aguinis et al., 2013). There were 11 and 13 observations with leverage values above the cutoff point in the baseline and mediation model, respectively (see Table 1). Importantly, all the 11 high-leverage cases identified in the baseline model, reappeared in the mediation model, which indicates that majority of the high-leverage cases

are not specific to our proposed model. Indeed, their scores are poorly predicted even in the baseline model, which is well-established in the theory.

Table 1: Outliers detection - A summary

1	2	3	4	5	6	7	8	9	10	11	12	13
Case ID	Leverage		Studentized deleted residuals		Model fit (Δ in R-squared)		Prediction outliers					
							DFFITS		Cook's d		DFBETAS	
	Baseline model	Mediation model	Baseline model	Mediation model	Baseline model	Mediation model	Baseline model	Mediation model	Baseline model	Mediation model	Baseline model	Mediation model
9			√*	√	↑**	↑	√	√	√	√	X (↓) ***	X (↓) M (↓)
22	√	√			↔	↔						
25				√	↔	↑		√		√	X (↓)	X (↓) M (↓)
31	√	√			↓	↔						
32	√	√			↓	↔						
57	√	√			↔	↔	√	√	√	√		
58	√	√			↔	↔	√	√	√	√	X (↑)	X (↑) M (↔)
65	√	√			↓	↔						
66		√		√	↑	↑	√	√	√	√		X (↔) M (↓)
91		√			↓	↓						
93	√	√			↓	↔						
102			√	√	↑	↑	√	√	√	√	X (↓)	X (↓) M (↔)
106	√	√	√		↑	↔	√	√	√	√	X (↓)	X (↓) M (↑)
112	√	√			↔	↔						
124	√	√			↓	↔						
128	√	√			↓	↔						
131			√	√	↔	↔	√	√	√	√		X (↔) M (↑)

* “√” indicates that an observation lies above the cutoff point in particular outlyingness detection technique.

**“↑”, “↓”, “↔” indicate that an observation increases, decreases, or does not affect the model fit in columns 6 and 7.

***Following the logic of the previous point, the symbol with X and/or M prior to an arrow indicates the direction in which an observation affects the regression coefficients of the independent, and mediating variables, respectively.

Regarding the outlyingness based on regression residual scores, we have calculated the studentized deleted residual values (Aguinis et al., 2013). By using the recommended cutoff value of $t_{108} \approx 1.98$, we have identified 4 and 5 potential outliers in the baseline and mediation model, respectively (see Table 1, columns 4 and 5).

Thus, we have identified in total, 17 potential error outliers. According to the recommendations provided by Aguinis et al. (2013), we have investigated all the identified cases, separately. The objective of the ‘case by case’ investigation was to determine if the outlyingness of these cases was caused by some kind of error, or by some potentially valuable information that we have overlooked while grounding the hypothesis. This investigation has however, suggested that the location of the identified cases is not caused by some kind of data entry or coding errors. Moreover, since our sample comprises the entire organization, the possibility that we have included observations that should have been in fact excluded from the statistical analysis, is not grounded. Finally, our investigation has not derived valuable information hidden in the identified cases that may lead to alternative hypothesis and possibly to an unexpected, and new theoretical knowledge. The identified cases, for instance, come from various hierarchical positions, different organizational departments, and their tenure in the company is close to the mean value.

Since we have not identified error and interesting outliers, we investigated if, and how, the outliers detected throughout multiconstruct techniques may affect the model fit and parameter estimates. As the Table 1 shows, there are several cases that can affect the model fit if removed. For example, the removal of the case with id=66 will result in an increase of model fit, measured by R^2 , in both the baseline and the mediation models.

As suggested by Aguinis et al. (2013), the final step in detecting influential outliers involves testing the impact that the identified cases have on the parameter estimates. For this

purpose, we have applied three different techniques. First, we have calculated DFFITS (i.e., difference in fit, standardized), and Cook's distance values, which combine information about leverage and residual distance (Chatterjee and Hadi, 2009). These two techniques thus, assess the extent to which an observation has impact on both the slope and the intercept of the regression line (Aguinis et al., 2013). As the Table 3 shows, there are 8 observations that lie above the cutoff points set for the two techniques (i.e. $\pm 2/\sqrt{(k+1)/n}$ for DFFITS, and $4/n$ for Cook's distance; where k is number of predictors and n is number of observations) in the baseline and/or the mediation model. While DFFITS and Cook's distance assess the outliers' impact on all regression coefficients as a whole, DFBETAS technique assesses the influence of a particular case on single regression coefficients. By setting the cutoff point at $\pm 2/\sqrt{n}$, we have assessed the influence of the identified outliers on the estimates of interest, that is intrinsic motivation and providing work-related advice. Thus, case with id=9, for example, decreases the regression coefficient of intrinsic motivation in the baseline model, and decreases the regression coefficients of both intrinsic motivation and providing work-related advice, in the mediation model.

Consistent with the guidelines provided by Aguinis et al. (2013), we followed the 'deletion strategy' for handling the detected outliers. The conducted analysis shows that there are 5 cases that have been identified as outliers in all the procedures, and at the same time, have the capacity to improve the model fit in the baseline and/or mediation model (i.e., observations with id 9, 25, 66, 102, and 106). The cases with id=58 and id=131, for example, have been detected as outliers in all the procedures except, in the model fit procedure. Therefore, these two cases were not deleted from the data set. In the subsequent section, we formally report the results without the five detected outliers. However, we will compare and report the results with and without the outliers.

Results

Descriptive statistics and correlations for the variables included in our models are shown in Table 2. It is apparent that zero-order correlations provide *prima facie* evidence for the theorized mediation model. Thus, intrinsic motivation is significantly and positively related to both innovative behaviour ($\beta = 0.30, p < 0.01$) and providing work-related advice ($\beta = 0.15, p < 0.10$). Providing work-related advice is, in turn, positively and significantly related to innovative behaviour ($\beta = 0.45, p < 0.01$).

Table 2: Descriptive statistics and Pearson correlations

	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12
1 Innovative behaviour	47.63	10.74	18	67	1											
2 Intrinsic motivation	85.42	9.38	62	110	0.30**	1										
3 In-degree centrality in advice relations	5.00	3.85	0	19	0.45**	0.15†	1									
4 Network size	6.74	6.72	1	35	0.07	0.15	0.12	1								
5 Number of friends	2.14	2.33	0	12	0.03	0.01	0.25**	0.18*	1							
6 Supervisors' span of control	0.99	2.30	0	11	0.12	0.18*	0.29**	0.20*	-0.00	1						
7 Self-monitoring	51.26	7.58	28	68	0.02	0.40**	0.03	0.18†	0.09	0.18†	1					
8 Hierarchical position	1.35	0.74	1	4	0.26**	0.03	0.41**	0.31**	-0.09	0.66**	0.10	1				
9 Job tenure	2.37	2.14	0	10	0.15	-0.04	0.36**	0.19*	0.12	0.37**	0.02	0.48**	1			
10 Educational level	2.44	1.00	1	4	0.17†	0.05	0.10	0.01	0.00	0.12	0.13	0.10	-0.17*	1		
11 Age	34.58	8.21	23	63	0.16†	0.09	0.16†	0.10	-0.09	0.28**	0.06	0.46**	0.31**	-0.11	1	
12 Gender	0.66	0.48	0	1	0.14	-0.01	0.18†	0.12	-0.07	0.14	-0.04	0.16†	-0.03	0.14	0.07	1
† p < 0.10																
* p < 0.05																
** p < 0.01																

In Table 3, we present the results of OLS estimations performed in three models, which reflect the four steps suggested by Baron and Kenny (1986). In Model 1, we tested if intrinsic motivation is positively associated with innovative behaviour, and consistent with the findings of Amabile et al. (1994), and Grant and Berry (2011), we found support for our baseline hypothesis ($c = 0.44, p < 0.01$). Model 2 reflects the second causal step as suggested by Baron and Kenny (1986), and indeed shows that intrinsic motivation is positively and significantly related to providing work-related advice ($a = 0.08, p < 0.05$), thus supporting our Hypothesis 2. In Model 3 we show that providing work-related advice is positively related to innovative behaviour, thus supporting our Hypothesis 3a ($b = 0.99, p < 0.01$). The regression coefficient of intrinsic motivation, on the other hand, has decreased from $c = 0.44$ in the baseline model (Model 1) to $c' = 0.35$ in the mediation model (Model 3), which is the fourth step required for establishing a mediation model. Intrinsic motivation in Model 3 is still significant ($p < 0.01$), which suggests that its effect on innovative behaviour is partially mediated by providing work-related advice. Despite the fact that the proposed mediation model appears to be significant according to the causal steps approach, we examined the significance of the mediated (or indirect effect) by conducting several additional analyses.

Drawing on the product approach (e.g. MacKinnon et al., 2007), we calculated the indirect effect as a product of estimates \hat{a} and \hat{b} , and according to the formula for testing significance of the indirect effect as suggested by Sobel (1982), we obtained $\hat{a}\hat{b} = 0.08$ ($SE = 0.04, p = 0.05$). Because the product of estimates \hat{a} and \hat{b} are typically not normally distributed, scholars have suggested using resampling methods, such as bootstrapping, for testing the significance of indirect effect (e.g. MacKinnon et al., 2007; MacKinnon et al., 2004). Accordingly, we calculated the 95% confidence interval (CI) for the indirect effect by bias-corrected bootstrap with 10,000 resamples,

obtaining CI of 0.02 at the lower limit, and 0.19 at the upper limit. Since zero is not in the biased-corrected confidence interval, we may conclude that the indirect effect is significant.

Table 3: Results of OLS Regression Models of Innovative Behaviour (Model 1 & Model 3) and Providing Work-related Advice to Many Colleagues (Model 2)¹

	Model 1	Model 2	Model 3
Constant	2.87 (10.66)	-6.79† (3.51)	9.60 (10.30)
<i>Controls</i>			
Gender	2.92 (1.98)	1.59* (0.65)	1.34 (1.93)
Age	0.09 (0.13)	-0.00 (0.04)	0.09 (0.12)
Educational level	1.42 (1.08)	-0.00 (0.35)	1.43 (1.02)
Job tenure	0.80 (0.52)	0.51** (0.17)	0.30 (0.51)
Hierarchical position	6.20* (2.70)	3.10** (0.89)	3.12 (2.71)
Self-monitoring	-0.19 (0.14)	-0.03 (0.04)	-0.15 (0.13)
Supervisors' span of control	-1.06† (0.59)	-0.18 (0.19)	-0.88 (0.56)
<i>Network structure</i>			
Number of friends	0.22 (0.43)	0.45** (0.14)	-0.23 (0.43)
Network size (out-degree centrality)	-0.01 (0.16)	-0.03 (0.05)	0.01 (0.15)
Providing work-related advice (in-degree centr.)			0.99** (0.28)
<i>Independent variable</i>			
Intrinsic motivation	0.44** (0.11)	0.08* (0.04)	0.35** (0.11)
R ²	0.24	0.36	0.32
Adj. R ²	0.16	0.29	0.24
F	3.20**	5.75**	4.34**
N	115	115	115
†	p < 0.10		
*	p < 0.05		
**	p < 0.01		

¹ Figures in parenthesis are the standard errors of the regression coefficients.

We ran several additional tests to examine the robustness of the proposed model. First, as previously mentioned, we have performed the statistical mediation analysis by including the outliers. As the Table 4 shows, the causal steps approach still provides support for all the hypotheses tested in this paper. Thus, in the baseline model, intrinsic motivation is positively and significantly associated with innovative behaviour ($c = 0.27, p < 0.01$). The regression coefficient of intrinsic motivation as a predictor of the mediating variable is higher than in the model without the outliers ($a = 0.10, p < 0.01$ in the model without the outliers vs. $a = 0.08, p < 0.05$ in the model with the outliers). The effect of providing work-related advice on innovative behaviour is smaller but still highly significant when adjusted for intrinsic motivation ($b = 0.99, p < 0.01$ in the model without the outliers vs. $b = 0.63, p < 0.05$ in the model with the outliers). Finally, the effect of intrinsic motivation on innovative behaviour, when controlling for providing work-related advice, decreased ($c' = 0.20, p < 0.10$), indicating partial mediation through the mediating variable. According to the Sobel's (1982) product test of significance, the indirect effect, that is \widehat{ab} , has diminished in size (i.e., from 0.08 to 0.06), but is still significant at $p < 0.10$ with 95% CI [0.00, 0.16]. The bias-corrected 95% CI was 0.00 at the lower limit and 0.18 at the upper limit. It is important to note that the proportion of variance explained in the mediation model that excludes the outliers is considerably higher than in a model where the outliers are present ($R^2 = 0.17$ in the model with the outliers vs. $R^2 = 0.32$ in the model without the outliers). This was indeed, the main reason why we have formally presented the models without the detected outliers, as suggested by Aguinis et al. (2013) (see also Preacher and Kelly, 2011).

Table 4: Comparison of the estimates of interest with ($N = 120$) and without ($N = 115$) the influential observations

Model	Estimate		SE		p		CI (lower)		CI (upper)	
	N = 120	N = 115	N = 120	N = 115	N = 120	N = 115	N = 120	N = 115	N = 120	N = 115
Model without mediator (Model 1)										
Intercept	14.25	2.87	11.40	10.66	0.21	0.79	-8.34	-18.26	36.83	24.01
X -> Y (c)	0.27	0.44	0.11	0.12	0.02	0.01	0.04	0.07	0.49	0.53
$R^2_{Y,X}$	0.14	0.24								
Model with mediator (Models 2 & 3)										
Intercept	18.86	9.60	11.38	10.30	0.10	0.35	-3.69	-10.83	41.41	30.04
X -> M (a)	0.10	0.08	0.04	0.04	0.01	0.02	0.02	0.01	0.18	0.15
M -> Y (b)	0.63	0.99	0.28	0.28	0.03	0.00	0.07	0.43	1.18	1.55
X -> Y (c')	0.20	0.35	0.12	0.11	0.08	0.00	-0.02	0.14	0.43	0.57
Sobel's Indirect effect (a X b)	0.06	0.08	0.04	0.04	0.09	0.05	0.00	0.00	0.16	0.18
Bootstrapped CIs for (a X b)							0.00	0.02	0.16	0.20
$R^2_{M,X}$	0.32	0.36								
$R^2_{Y,MX}$	0.17	0.32								

Second, we ran two additional analyses aimed at strengthening the causal inference of the proposed mediation model. In order to test if the size of the indirect effect measured by the product of coefficients \widehat{ab} is the causal estimator of the indirect effect, five requirements should be met: i) no confounding variables are present in the relation between X and Y; ii) no confounding variables are present in the relation between X and M; iii) no confounding variables are present in the relation between M and Y; iv) no effects of the independent variable that confound the relation between M and Y; and v) the interaction effect of X and M should not predict Y (see for example, MacKinnon et al., 2007). We tested for the five assumptions underlying a mediation model starting from the fifth requirement, because randomization of participants at the levels of the independent variable should eliminate the possibility for the presence of confounding variables in the relations between X and M, and between X and Y (MacKinnon and Pirlott, 2015). The interaction effect of X and M was relatively small and insignificant in both the mediation model with the outliers ($\beta = -0.05, p = 0.17$) and the mediation model without the outliers ($\beta = -0.04, p = 0.27$). In order to examine for the third and fourth abovementioned requirements, MacKinnon and Pirlott (2015) have suggested running structural equation modelling. As Table 5 demonstrates, in the mediation model with the outliers, the indirect effect was weakly significant ($a = 0.06, p < 0.10$), while in the mediation model without the outliers, the size and the significance of the indirect effect have both increased ($a = 0.08, p < 0.05$). Taking in consideration the results revealed in the analysis above, we further confirm the Hypothesis 3b.

Table 5: Structural equation modelling: Comparison of the estimates of interest with ($N = 120$) and without ($N = 115$) the influential observations

Model	Estimate		SE		p		CI (lower)		CI (upper)	
	N = 120	N = 115	N = 120	N = 115	N = 120	N = 115	N = 120	N = 115	N = 120	N = 115
Model without mediator (Model 1)										
Intercept	14.25	2.87	11.40	10.66	0.21	0.79	-8.34	-18.26	36.83	24.01
X -> Y (c)	0.27	0.36	0.11	0.11	0.01	0.00	0.06	0.15	0.48	0.57
Model with mediator (Models 2 & 3)										
Intercept	18.86	9.60	11.38	10.30	0.10	0.35	-3.69	-10.83	41.41	30.04
X -> M (a)	0.10	0.11	0.04	0.04	0.01	0.01	0.03	0.03	0.17	0.18
M -> Y (b)	0.63	0.70	0.26	0.26	0.02	0.01	0.11	0.20	1.14	1.21
X -> Y (c')	0.20	0.29	0.11	0.11	0.06	0.01	-0.01	0.07	0.42	0.50
Indirect effect	0.06	0.08	0.03	0.04	0.07	0.05	-0.01	0.00	0.13	0.15

DISCUSSION

Our study makes a step forward in understanding the mechanisms that link intrinsic motivation with individual innovative behaviour. The extant literature, and in particular, the psychologists, have argued that curiosity and interest for learning, emotions related to enjoyment and challenge, as well as persistence while conducting work-related activities are key mechanisms that explain the relationship between intrinsic motivation and innovative behaviour (Grant and Berry, 2011). On the other hand, researchers who have applied social network lenses to study individual innovative behaviour, have consistently shown that the position that an individual occupies within informal organizational networks does explain a considerable proportion of the variance in innovative outputs (Carnabuci and Dioszegi, 2015; Tortoriello and Krackhardt, 2010). Since intrinsically motivated individuals are able to accumulate certain psychological assets, the question that arises is how these assets can be used for acquiring advantageous network positions within the organizational social structures, which on the other hand, are inductive to an enhanced innovative behaviour. In order to address this question, we have integrated the psychological and social network perspectives, thus offering a structural mechanism that explain the relationship between intrinsic motivation and innovative behaviour. In the present study, we demonstrate that intrinsically motivated individuals are more likely to be asked for advice by their peers. The opportunity to provide work-related advice, in turn, enhances their innovative behaviour. Hence, our study makes three specific contributions to the literature, which were anticipated in the introductory part of this article, and in the subsequent paragraphs, we discuss them comprehensively.

The first theoretical contribution concerns the organizational networks literature, as our study offer important insights about the network position of individuals who possess high levels of intrinsic motivation. The organizational network research has only recently started to emphasize the importance of individual agency in creating social networks, which was greatly overlooked by the structuralist perspective on social networks (Kilduff and Krackhardt, 1994). The current debate on whether individual attributes can explain centrality and/or brokerage positions within social networks (Kilduff and Brass, 2010) has been fueled by substantive amount of empirical evidence. It has been demonstrated, for example, that individual differences, such as self-monitoring (Mehra et al., 2001; Oh and Kilduff, 2008), openness to experience, and extraversion (Lönqvist et al., 2014), are important factors that predict the positions within the social structures where individuals are embedded. Responding to a recent call for studying motivational variables as micro-foundations of social networks (Tasselli et al., 2015), we drew from the psychological perspective of individual innovative behaviour. Our study reveals how the micro-level motivational processes affect structural position of individuals embedded in networks of advice relationships. We show that intrinsically motivated individuals are more likely to be asked for advice by their colleagues at work, thus becoming central figures within the organizational networks. Prior experimental research has argued that individuals form positive expectations regarding the quality of advice that can be eventually received from intrinsically motivated people (Wild et al., 1997). The organizational members thus, perceive the enthusiasm and enjoyment, interest in learning, and commitment that intrinsically motivated colleagues continuously demonstrate towards the tasks at hand. As a result, the advice seeking relationships of organizational members are directed towards the individuals with higher levels of intrinsic motivation, who will have the opportunity to provide work-related advice.

The opportunity attained by intrinsically motivated individuals to provide work-related advice, and its positive association with innovative behaviour is indeed, the second major contribution of this study. By this we contribute to the current debate in the organizational network research about the utility of interpersonal ties. From one hand, scholars have emphasized that receiving valuable resources is the key benefit for individuals embedded in advantageous network positions (Kilduff and Brass, 2010; McFadyen and Cannella, 2004). This line of inquiry has demonstrated that the number of people with whom an individual interacts is beneficial for innovative behaviour (Perry-Smith, 2006; Perry-Smith and Shalley, 2003). On the other hand, and only recently, Shah et al. (2015) have argued that providing rather than receiving resources via interpersonal ties brings benefits to providers. They have demonstrated that the number of ties, through which individuals provide problem-solving assistance, is positively associated with job performance. Complementary to this, we show that providing work-related advice is positively associated with innovative behaviour, thus extending the knowledge generated by the recent study of Shah et al. (2015). In respect to the study of Shah and colleagues, our paper uses a broader construct to conceptualize the predicting variable, but narrower construct to conceptualize the dependent variable. Drawing on the constructivist perspective we emphasize the benefits attained by individuals who provide work-related advice. The benefits, according to the constructivist approach, derive from the knowledge pool that advice providers are able to accumulate from experience, and interaction with diverse organizational members who seek advice (Singh et al., 2015). Thus, the knowledge flow is not directed solely towards advice seekers, but instead, it flows in both directions (Elkjaer, 2003), creating for advice providers an opportunity to combine and recombine knowledge, which in turn, is essential for generating, promoting and, implementing novel ideas (Fleming, 2001; Gilson and Shalley, 2004; Perry-Smith and Shalley, 2003). Hence, we

argue that beyond job performance, providing resources via interpersonal ties in organizational context, enhances one's innovative behaviour as well.

The third, and probably the most intriguing theoretical contribution of the present study concerns the mediating effect of providing work-related advice in the relationship between intrinsic motivation and innovative behaviour. The organizational creativity literature has for long mirrored the literature on general psychology, which draws from the self-determination (e.g. Deci and Ryan, 1985a) and positive emotions theory (e.g. Isen and Reeve, 2005), to propose psychological explanations for the relationships between the two constructs. Our findings indeed, confirm the presence of psychological mechanisms, which is evident by the fact that the regression coefficient of intrinsic motivation remained highly significant when we controlled for the mediator ($p < 0.01$). Hence, our empirical findings complement the accumulated knowledge from the literature on personal psychology, and demonstrate that beyond, and above the psychological mechanisms, the relationship between intrinsic motivation and innovative behaviour is explained by a structural mechanism. By doing so, we contribute to the ongoing debate about the intersection point between personal psychology and social network research (Balkundi et al., 2011; Carnabuci and Dioszegi, 2015; Kilduff and Brass, 2010). This study breaks new ground to suggest that a significant proportion of the effect that intrinsic motivation has on innovative behaviour is mediated by a variable that was operationalized by counting the advice seeking nominations received by the employees in an organization. Our findings are also consistent with the recent meta-analysis of Fang et al. (2015), who have shown that network position, and in particular, in-degree centrality, partially mediated the relationship between personality and performance variables.

Limitations and future research

The theoretical contributions of this study should be taken in consideration in light of several limitations, which in turn, create opportunities for future research. First, we did not test for several moderators that may further explain the conditions under which the proposed mediation model works at its best. For example, extant literature has found that intrinsically motivated individuals are more innovative when they are prosaically motivated (Grant and Berry, 2011). Although we have controlled for endogeneity in the relationship between intrinsic motivation and providing work-related advice, future scholarship may further investigate the possibility that prosocial motivation moderates the effect of intrinsic motivation on providing work-related advice. We would expect that intrinsic motivation will maximize the likelihood that individuals are sought out for advice by their colleagues at higher levels of prosocial motivation. Thus, it can be that intrinsically motivated individuals may further augment the frequency of providing work-related advice if they are prosaically motivated.

Although we have controlled for the possible ‘noise’ from the formal organizational relationships that can be echoed in the informal advice ties (Oh et al., 2006), future studies may apply explicit tools to account for this, second limitation of our study. In the present study, we have not considered the ties directed from subordinates to supervisors. However, consistent with the work done by Human Resource Management (HRM) scholars (see for example, Soltis et al., 2013), future research may operationalize the advice relationships by asking the respondents to report if advice seeking is, in general, formal or informal. It can be that the mediating effect of providing solely informal work-related advice is stronger in comparison with work-related advice that is provided because of certain formal organizational duties.

Third, future studies may test the model in different sociocultural contexts. Although our study is well-aligned with the aforementioned theories of work motivation, organizational networks, and individual creativity and innovation, it can be that different sociocultural contexts may affect the outcome of the proposed relationships. The research has suggested that the Asian people, being culturally entrenched in Confucianism, might emphasize the importance of interpersonal relations more than the people in Western societies (Barkema et al., 2015). Hence, we call for a culturally-informed research that will investigate if the structural mechanism proposed in this study increases its mediating effect when tested in Eastern contexts. Since it has been suggested that intrinsic motivation is an enduring personal characteristic that vary insignificantly across social contexts (Amabile et al., 1994), and the people living in the Eastern societies are relationship-centered, we would expect that the mediating effect of providing work-related advice will be stronger in such a sociocultural context.

Managerial implications

Our study provides several implications for managers and employees. The first managerial implication derives from our baseline hypothesis, which suggest that intrinsic motivation encourages the innovative behaviour of individuals at work. Hence, managers should hire employees that are intrinsically motivated, and create conditions in the working environment that are conducive to intrinsic motivation. Such conditions should involve managerial practices such as rewards, recognition, and feedback that foster the three basic psychological needs of autonomy, competence, and relatedness (Amabile et al., 1996). Indeed, it has been shown that the managerial practices directed towards satisfaction of the abovementioned psychological needs, promote employees' intrinsic motivation (Ryan and Deci, 2000).

Above and beyond the necessity to cultivate conditions that foster intrinsic motivation, our study suggest that managers should promote organic rather than bureaucratic (or a so-called “Weberian”) organizational structure. In light of the ongoing debate about which type of organizational structure is more conducive to performance related outcomes (e.g. Sine et al., 2006), our findings suggest that an organic, or horizontal organizational structure, enables enhanced innovative behaviour. Towards this end, the managers should design the work activities to be less routine; should foster the communication among organizational members; and should diminish the influence distance among organizational members (Aiken et al., 1980).

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4. Paper III: The moderating role of alters' professional background in the relationship between social network brokerage and innovative behaviour

Abstract

There is a growing interest among the scholars to study the contingencies that enable or impede individuals embedded in brokering network positions to enhance their innovative behaviour. Still, there are substantial knowledge gaps in the literature about the conditions that permit social network brokers to integrate and process the information and knowledge that come from the disconnected parts of the network that the brokers bring together. Drawing on the complementarity fit theory, we suggest that network diversity in respect to the professional background of one's direct contacts is a key condition that determines the relationship between brokerage and innovative behaviour. We tested our theory on a sample of employees in a medium-size consulting company ($N = 134$, response rate = 88%), located in the northern Italian region of Lombardy. We discuss the theoretical and practical implications as well as the potential limitations of our study.

INTRODUCTION

The brokers occupy positions in a social network that allow them to connect individuals and groups that are otherwise disconnected from each other (Burt, 1992). By bridging the gaps within a social structure (i.e., structural holes), the brokers have timely access to non-redundant information and knowledge that circulates in the different parts of a network as well as control over the flows of these key organizational resources (Burt, 2005; Kilduff and Tsai, 2003). Such an advantageous position within the social structure represent capital that brokers can use to find a job (Granovetter, 1973), get promotions at work (Burt, 2002) and to enhance their innovative behaviour (Burt, 2004; Obstfeld, 2005). Since the innovative behaviour of individuals at work enable organizations to come up with innovative products and service (van de Ven, 1986), which in turn, is essential for organizational long-term survival and success (Damanpour and Schneider, 2006), in this study, we examine the conditions under which the social network position of individuals enable or impede the innovative behaviour.

There is indeed, a growing scholarly interest in investigating the contingencies that enable or impede individuals embedded in brokering network positions to enhance their innovative behaviour (Carnabuci and Diószegi, 2015; Fleming and Waguespack, 2007; Fleming et al., 2007; Tasselli, 2015; Tortoriello and Krackhardt, 2010). For instance, Carnabuci and Diószegi (2015) have shown that the relationship between brokerage and innovative behaviour is contingent upon the cognitive style of the focal actor. They have demonstrated that the individuals with an adaptive cognitive style will enhance the innovative behaviour if they are embedded in closed networks of social relationships (i.e., a structural variable that opposes brokerage). Tortoriello and Krackhardt (2010) on the other hand, have argued that the informal ties that span the formally defined

organizational boundaries are more inductive to innovative behaviour when considered in conjunction with cohesive social structure. The two example studies show that the benefits from holding an advantageous network position can be strengthened under specific conditions that underlie the personal characteristics (Carnabuci and Diószegi, 2015), but also alternative aspects of the social structure in which actors are embedded, as it is the case in the study of Tortoriello and Krackhardt (2010).

However, although we have better understanding about the conditions under which social network brokerage affects innovative behaviour, there are substantial theoretical gaps in the literature about the conditions that enable or impede the brokers to integrate and process the information and knowledge that come from the different parts of the network (Tortoriello and Krackhardt, 2010). Indeed, brokering network position provides the focal actor with timely access to non-redundant information and knowledge, but at the same time, such a network position exposes the broker to the challenge to continuously balance between the competing sets of norms that prevail in the distant social circles (Krackhardt, 1999). Because of the differences in the narratives and perspectives as well as the lack of common understandings and shared meanings in the interaction with members of distant social groups, brokers may struggle to integrate and make sense of the available knowledge and information (Bechky, 2003). Thus, it has been argued that the benefits of brokerage may vanish across the time (e.g. Sasovova et al., 2010). On the other hand, the individuals embedded in closed network of relationship—with fewer possibilities to span across the structural holes—can benefit from resources such as trust, support and coordination among densely connected actors (Coleman, 1988). Moreover, the information and knowledge flows will be facilitated among the actors embedded in closed networks of relationships (Fleming et al., 2007). These individuals will nevertheless, face the challenges to have access to diversified

information and knowledge that may circulate in disparate social circles (Burt, 1992; 2004). Thus, both the brokering and closed network positions provide the actors with certain strengths as well as weaknesses. The extant literature is still inconclusive about which network structure, and under which conditions can affect innovative behaviour (Perry-Smith and Mannucci, 2015).

Drawing on the complementarity fit theory (Boland and Tenkasi, 1995; Cross and Parker, 2004), we suggest that network diversity in respect to the professional background of one's direct contacts is a key condition that determines the relationship between brokerage and innovative behaviour. The professional background is indeed, a salient social category that embodies the diversity of information and knowledge that circulates in an organization (Anteby et al., 2016). The different professional groups have disparate type of information and knowledge, and those important resources that are exchanged among the actors in a network a more homogeneous within rather than between the professional groups (Burt, 2007). We suggest that network diversity in respect to the professional background is a key contingency that explain the relationship between brokerage and innovative behaviour. By interacting with similar others, the brokers may facilitate the transmission of tacit knowledge (Cross et al., 2001), simplify coordination (Ancona and Caldwell, 1992), and avoid potential conflicts (Pfeffer, 1983). Thus, we develop a 'complementarity fit' argument that emphasizes the importance of professional background of others into current network theory of social capital.

By showing that network diversity with respect to the professional background is a key contingency in the relationship between brokerage and innovative behaviour, we contribute to the recent debate among the scholars in the contingency view of social networks (Anderson, 2008; Carnabuci and Diószegi, 2015; Tortoriello and Krackhardt, 2010). Drawing on the complementarity fit argument, the present study shows that the weaknesses related to brokering

network positions can be offset if actors strategically form ties, based on the professional background of the coworkers. Moreover, we contribute to the diversity theory and research, which has traditionally focused on diversity within formally defined organizational units such as groups and teams (Gilson et al., 2013; van Knippenberg et al., 2004; 2011). We extend this line of inquiry by highlighting the importance of diversity within the informal networks of advice relationships.

The paper is organized as it follows. First, we set the theoretical framework to ground our hypothesis. Second, we elaborate the research methods that we undertook to test our theory. In the third section, we reveal the results of our empirical analysis. Finally, in the last section, we discuss the findings, its practical implications, and the obvious limitations that open new avenues for research in the field.

THEORY AND HYPOTHESES

Brokerage and innovative behaviour

Consistent with Scott and Bruce (1994), and Janssen (2000, 2001), we define innovative behaviour as a process that consists of generation, promotion and implementation of novel ideas that are meaningful and useful within the context where innovative process takes place. Presuming that innovative behaviour is a desired organizational outcome and a critical constituent of organizational innovativeness (Woodman et al., 1993), researchers have made notable efforts to understand the contextual factors that enable or impede individuals to generate, promote, and implement novel and useful ideas (Amabile, 1983; Wang et al., 2015a). Indeed, there is a widespread scholarly consensus that the substantial part of the variance in innovative behaviour is

explained by features of social networks in which individuals are embedded (Baer et al., 2015; Perry-Smith and Mannucci, 2015).

The social capital theory posits that individuals engage into social relationships in order to gain access to valuable resources (Adler and Kwon, 2002). The type of resources that individuals may obtain by interacting with their colleagues at the workplace will depend on their position in a network of interpersonal relationships (Burt, 2000). We may think of all the positions in a social structure as a continuum, where on the left-hand side we may place the individuals whose direct contacts are all interconnected among each other. On the right-hand side of the continuum, we may place the individuals whose direct contacts are all disconnected from each other. The former structural position implies complete network closure, whereas the latter implies complete network brokerage. Indeed, closure and brokerage are the key perspectives underling social capital theory, as they predict different type of resources on which an actor can potentially take advantage (cf. Burt, 1992; Coleman, 1988; Granovetter, 1973). For the purposes of the present study, we conceptualize the position of an actor on the abovementioned continuum as a level of brokerage. Brokerage thus, denotes the degree to which an individual connects otherwise disconnected parts of a network (Baer et al., 2015). The definition implies that when brokerage is low, an actor is embedded in a closed network, while in situations where brokerage is high, an actor is embedded in brokering networks. The embeddedness in closed or brokering network position thus, suggests “that resources and information do not flow equally among all actors” (McEvily et al., 2014: 311). The distribution of resources, and their type, which are available to actors embedded in those diametrically opposing network positions are discussed in the following paragraphs.

The individuals embedded in brokering network positions, by spanning the structural holes that exist between the disconnected parts of a network, will benefit from having timely access to

non-redundant information and knowledge that circulates within the different social clusters (Burt et al., 2013). The non-redundancy of information and knowledge that is available to actors that connect otherwise disconnected parts of the network can be explained by the similarity fit that is in line with the homophily theory. According to this theoretical perspective, people tend to form ties with those who are similar to them with respect to certain demographic (e.g. gender, age, ethnicity) as well as informational/functional characteristics such as functional and professional backgrounds (e.g. Blau, 1977; Burt, 2007; McPherson et al., 2001;). Since brokerage position implies connecting otherwise disconnected parts of a network (Baer et al., 2015), homophily theory suggests that these disconnected parts are dissimilar among each other because, if they were similar, they would have been tied to each other. Therefore, it is assumed that brokers are posited in a network position that allows them to connect parts of a network that are *dissimilar* among each other (Fang et al., 2015). The premises of homophily theory are important for conceptualizing the brokering network positions because it implies that brokers are involved into combination of diversified information and knowledge. The ability to approach the work-related problems from unusual perspectives is indeed, an essential characteristic of people who behave in an innovative way (Singer, 1990). The exposure to different perspectives can thus, enhance brokers' ability to learn about the solutions to certain problems implemented elsewhere, and to apply the new knowledge into their own work domain (Hargadon, 1999). As the theory of social psychology suggests, the combination and recombination of different perspectives in one's own work increases the cognitive flexibility, that is, the ability of an individual to shift the thinking from one to another concept (Taylor and Greve, 2006). Indeed, cognitive flexibility has been recognized as a key psychological mechanism that allows an individual to generate novel and useful ideas (Amabile, 1983).

Furthermore, positioned as the lone connectors between separate groups in a network, brokers have opportunities for arbitrage over the flows of information and knowledge (Burt, 2005). They have the possibility to autonomously deploy important organizational resources in a way that their own ideas are successfully promoted and implemented (Burt, 1992). To sum up, the early access to non-redundant information and knowledge as well as the arbitrage position over the flow of these resources are identified as two key mechanisms that explain the relationship between brokerage and innovative behaviour (Baer et al., 2015).

Oppose to complete brokering network positions, the access to non-redundant information and knowledge will be hardly accessible to the individuals that are embedded in closed networks of relationships (Granovetter, 1973). Because of such a redundancy of the available information and knowledge to which they are exposed, the closely tied individuals may face considerable difficulties to come up with novel and useful ideas (Burt, 2004). The complete network closure may instead, provide actors with access to alternative but still useful resources such as trust, support and cooperation (Coleman, 1988), which may be essential for the later phases of innovative behaviour where an individual is expected to mobilize support and build a consensus for successfully promoting and implementing novel ideas (Perry-Smith and Mannucci, 2015). However, the prevailing scholarly standpoint is that brokerage rather than network closure has greater predictive power on the overall process of innovative behaviour (Burt, 2005). Following this line of reasoning, the past research has accumulated a substantial empirical evidence indicating that social network brokerage is positively related to innovative behaviour (e.g. Burt, 2004; Carnabuci and Diószegi, 2015). Correspondingly, we formally state our baseline hypothesis as:

H1: Brokerage is positively related to innovative behaviour.

Why brokerage may not be enough for an enhanced innovative behaviour

Because of the importance of brokerage for a number of desired organizational outcomes, among which, innovative behaviour, the research has started to investigate its antecedents (Fang et al., 2015; Janicik and Larrick, 2005). It has been argued for instance, that brokers tend to score high on self-monitoring, that is, a psychometric variable that depicts the degree to which individuals can adopt their behaviour with respect to the different social situations in which they find themselves (Oh and Kilduff, 2008; Sasovova et al., 2010). The individuals who score high in self-monitoring possess social skills that permit them to easily engage into interaction with different groups of people (Ickes et al., 2006), partly because of their capability of simultaneously playing different, and often incompatible roles (Snyder, 1987). They do not hesitate to turn out for advice to the most powerful figures in a social network (Fang and Shaw, 2009), to adjust their conversation appropriately (Dabbs et al., 1980), and to take advantage of interpersonal relationships for achieving their own objectives (Fuglestad and Snyder, 2010). Such an alertness that they express in pursuing social relationships often render self-monitors popular targets for other people in expressive as well as instrumental networks (Fang et al., 2015). The brokers, being at the same time high-self monitors, can thus, easily form ties with different, and often disconnected groups in a network (Burt et al., 2013). The research has shown however, that once obtained the brokerage position is difficult to be protected and retained (Sasovova et al., 2010).

By connecting distant parts of the network that are dissimilar from each other, brokers face behavioural constraints that stem from the fact that they need to simultaneously adhere to the competing norms prevailing in the different social clusters (Krackhardt, 1999; Podolny and Baron, 1997). Behaving in a way that is perceived by group members as a violation of well-established norms will consequently, prevent brokers from exploiting the benefits of spanning the structural

holes (Podolny and Baron, 1997). Taking into consideration also that brokers' behaviour is hardly monitorable, they are likely to be inclined towards strategic filtering, and distortion of the available information and knowledge (Balkundi et al., 2007). If organizational members recognize that exchange of resources is being manipulated, the lack of trust that will result, can inhibit the exchange of resources, which in turn, can impede brokers' innovative behaviour (Černe et al., 2014).

Additional limits for the brokers to capitalize on their position relate to the difficulties to integrate the non-redundant information and knowledge that is available to them. As some researchers have pointed out, the opportunities to access non-redundant information do not translate automatically into an enhanced innovative behaviour (Ahuja, 2000). Having access to non-redundant information and knowledge means that brokers may potentially receive these resources from groups that have completely different perspectives on the work and the organization (Boland and Tenkasi, 1995; Cross and Parker, 2004). The fact that knowledge is more homogenous within rather than between professional groups (Burt, 2007), can pose challenges for brokers to integrate the available information and knowledge. Being involved into a discussion over work-related issues with groups sharing different perspectives can be challenging and it may require 'speaking' of an unfamiliar language. This on the other hand, may be perceived as improper among the members of distinct social groups who share disparate cognitive and behavioural modes (van Knippenberg et al., 2004). Hence, being exposed to different perspectives on how the work should be done may be an important source of novel and useful ideas (Burt, 1992), but at the same time, imposes challenges for brokers to integrate and make sense of the available information and knowledge, which can ultimately undermine their innovative behaviour (Ahuja, 2000; Cohen and Levinthal, 1990).

Moreover, the advantages related to brokerage may benefit some phases of an innovative process but not the others (Perry-Smith and Mannucci, 2015). As noted above, innovative behaviour includes generation, promotion, and implementation of novel and useful ideas within a given context (Janssen, 2000, 2001). Whereas generating an idea may require continuous exploration and bringing different perspectives together (Miron-Spector et al., 2011), implementing an idea and putting it into practice may require support, alignment and coordination among organizational actors (Kijkuit and Van Den Ende, 2007). The research has thus, shown that brokers by spanning the structural holes have access to diverse information and knowledge, which is a critical prerequisite for generating novel ideas (Burt, 1992). On the other hand, being embedded in cohesive and closed networks (i.e., a network structure that is the reverse of brokerage) is expected to foster trust, support and coordination among the actors (Coleman, 1988), which can empower the later phases of innovative behaviour (Perry-Smith and Mannucci, 2015). It appears thus, that brokerage is conducive to idea generation but can impede idea promotion and idea implementation. The latter two phases of innovative behaviour could be positively associated with more closed networks as they foster trust, support and easier coordination among actors.

Our aim in this study is to explore the conditions under which brokers can enhance their innovative behaviour across all the three phases (i.e., idea generation, idea promotion, and idea implementation) by strategically forming ties that may facilitate the process of integration of information and knowledge that comes from the distant parts of a network. More specifically, we propose that the degree to which brokers differ with respect to the professional background from their providers of advice, determines the strength of the relationship between brokerage and innovative behaviour.

The moderating role of network diversity

The positive effects of brokerage on innovative behaviour are typically found in instrumental networks, such as the networks of advice relationships, where individuals exchange advice, information and knowledge as means for achieving certain work-related objectives (Fang et al., 2015). Since our goal here is to understand whether the social network brokers can enhance their innovative behaviour by integrating the diversified information and knowledge that circulate within a social network, in the present study, we focus on the professional background of individuals with whom a focal actor discusses work-related issues. The professional background is indeed, a social category that captures the informational and knowledge differences among individuals (Anteby et al., 2016). Aiming at a higher social status for professional group in which they belong, individuals are likely to trust and cooperate more with those belonging to the same category rather than with individuals belonging to another category (Tsui et al., 2002). Furthermore, it has been empirically demonstrated that knowledge and information are more homogenous within rather than between professional groups (Burt, 2007). In sum, the arguments surrounding the concept of professional background suggest that it is a salient category over which individuals differentiate themselves and the others (Anteby et al., 2016).

In this study, we use the professional background as an underlying category for conceptualizing network diversity. Consistent with Burt (1992) and Wang et al (2015b), we define network diversity as the degree to which the professional background of a focal actor differs from the professional background(s) of his or her advice provider(s). Thus, we may think of network diversity as a continuum, where on the low-end, there is complete network homogeneity, and on the high-end, there is complete network heterogeneity. The former denotes a context in which the focal actor, and all the co-workers from which the focal actor seeks advice, have same professional

backgrounds. The later denotes a context in which all the co-workers from whom the focal actor seeks advice have different professional backgrounds with respect to the professional background of the focal actor.

We propose that the weaknesses of brokers associated with the integration of information and knowledge can be offset by certain strengths rendered in the network diversity. In particular, we predict that individuals, whose network of advice relationships span many structural holes (i.e., high brokerage), should form ties with co-workers having the same professional background. The people from the same professional background share the same language, and interests, which facilitates communication, and fosters trust (Ibarra, 1992). Indeed, as Aral and Van Alstyne (2010: 9) have pointed out: “we are more likely to be inspired to cover more topical ground in conversation with those with whom we share a greater number of common interests”. Speaking a similar language and sharing the same interests over the work-related issues can thus, enable a meaningful communication among the actors, which in turn, is essential for the process of social exchange and combination of knowledge (Nahapiet and Ghoshal, 1998). Therefore, by interacting with similar others, the brokers may facilitate the transmission of tacit knowledge (Cross et al., 2001), simplify coordination (Ancona and Caldwell, 1992), and avoid potential conflicts (Pfeffer, 1983). Seeking advice from co-workers with same professional background hence is expected to resolve part of the difficulties of brokers related to transferring, integrating, and processing the diversified information and knowledge, which is available across the structural holes (Carlie, 2004). Consequently, the mutual understanding over the work-related issues as well as the facilitated coordination among individuals sharing the same professional background, is expected to enhance the later phases of innovative behaviour such as idea promotion and implementation, which may indeed require greater support and coordinated action (Obstfeld, 2005). In other words,

the interaction with co-workers having the same professional background is expected to help brokers to offset the weaknesses related to their nevertheless, heterogenous structural environment and thus, to enhance their innovative behaviour. To sum up, the innovative behaviour will be enhanced when complete network brokerage is complemented with complete network homogeneity, and when complete network closure is complemented with complete network heterogeneity.

The reversed logic holds for the individuals embedded in closed networks of relationships. Those embedded in such a network position do not face the challenges of brokers, such as the difficulties related to information and knowledge integration, nor they face the problems for finding support from other organizational members to promote and implement novel and useful ideas. Nevertheless, those embedded in closed networks may encounter problems related to generating novel and useful ideas because the information and knowledge in their imminent environment may be redundant (Burt, 1992). We propose that a closely embedded focal actor can offset the weaknesses related to information and knowledge redundancy by seeking advice from co-workers that have diverse professional background. Exposing themselves to people from different professional backgrounds, who differ from them with respect to information, knowledge, and expertise, will enhance their innovative behaviour by the influences on their cognitive flexibility (Perry-Smith and Shalley, 2003). Adding some diversity within a closed network is thus, expected to offset the weaknesses associated with generation of novel and useful ideas. Following this line of reasoning, we hypothesize that:

Hypothesis 2 (H2): Network diversity with respect to professional background will moderate the relationship between brokerage and innovative behaviour such that innovative behaviour will be higher when network diversity is lower.

METHODS

Research settings, sample and procedure

We tested our theory on a sample of employees in a medium-size international company, located in the northern Italian region of Lombardy. In the following part of the paper, we dub the company as Energetica to preserve its anonymity. Energetica's core business is providing consulting services and solutions regarding efficient consumption and use of energy. The clients' portfolio is composed of large energy consumers such as manufacturing companies, large corporations as well as public institutions. In order to satisfy the differing needs of its customers, and at the same time to gain competitive advantage, Energetica is devoted to nurturing a highly innovative corporate climate. During our preliminary interviews with the director of Human Resources Department, we were informed that Energetica is highly committed in fostering an environment, where employees are encouraged and rewarded for their innovative behavior. The individual innovative behaviour is indeed, a substantial part of the overall employees' performance appraisal system.

Aiming to provide tailored, and innovative solutions to its clients, Energetica's formal organization is composed of five business units, which organizational members are however, situated in single corporate premises. The employees of Energetica can be grouped into three

professional categories, that is, engineers, economists and legal staff. This categorization, according to Energetica's HRM management, corresponds to the aim of the company to provide tailored solutions and services to its customers. Moreover, the interviews revealed that the three groups have specific and often non-overlapping task-related objectives, which additionally makes the three professional groups different from each other. The differences between the groups which are salient to all employees, according to social-categorization theory influences the people to classify themselves and the others in respect to that attribute (van Knippenberg et al., 2004). Thus, the employees with economic background are responsible for the wide range of business administration activities such as marketing, sales, finance, and accounting. The employees with engineering professional background play a key role in evaluating the needs of the customers and developing tailored solutions and services. Finally, the employees with legal professional background are responsible for harmonization of the legal implications of company's solutions and services with the energy law and regulations within the European Union as well as the energy law and regulations across the international markets where Energetica is conducting its business operations.

Out of the total of 134 employees, 127 completed the social network questions, while 124 responded to all the questions in our online survey. After excluding the non-respondents and accounting for the missing responses from the supervisors, who were asked to evaluate the employees' innovative behaviour, a total of 118 employees were included in the empirical analysis, for a final response rate of 88%. Of those that participated, 63% were male. The mean age was 33.95 years ($sd = 7.90$), and the mean tenure in the company was 2.18 years ($sd = 1.99$). On average, the employees of Energetica have nominated 6.66 ($sd = 6.61$) colleagues as their sources of work-related advice. Out of 17 822 possible ties in the directed network of advice relationships,

1 988 were realized, for an overall network density of 0.11. Considering the employees at lower hierarchical positions, which comprise 77% of the sample, 63% of the ties were directed towards colleagues at lateral hierarchical level, and 60% span the departmental boundaries. These descriptive statistics support our assumption that the informal advice relationships play an important role in transferring knowledge, information, and experiences, among the employees of Energetica. Therefore, we believe, Energetica represents a suitable organizational setting to test our theory.

We utilized three sources of data, i.e. employees, supervisors, and co-workers, collected via two separate surveys in two time lags. In time one, we collected the data on personal characteristics and the informal advice relationships by distributing, via e-mail, an online survey to all the employees in Energetica. In time two, two weeks after the completion of the online survey, we approached each of the 30 supervisors in Energetica by e-mail, asking them to provide an assessment of innovative behaviour of their followers.

We stress that we collected social network data by using the roster method, that is, providing the respondents with an alphabetically ordered list of all employees in the company. It has been shown that roster method extracts more accurate information than a free recall method, regarding the respondents' contacts (Hammer, 1984). The accuracy of information is particularly important for studies on brokerage, as respondents tend to recall fewer structural holes, and such errors can be systematically affected by personal traits and past experiences of the respondents (Janicik and Larrick, 2005). The roster method, where respondents can list all the potential contacts in the network, is expected therefore, to mitigate these problems, and to offer greater information accuracy.

Measures

Dependent variable. We measured innovative behaviour by using the original nine-item scale developed by Janssen (2000, 2001), which is one of the most prominent measurement instruments used by organization and management scholars to operationalize individual-level innovative behaviour (Anderson et al., 2014). The scale is deemed to operationalize innovative behaviour as a three-dimensional construct, involving idea generation, idea promotion, and idea implementation. Alike the study of Janssen (2000), we found a high intercorrelation between the three dimensions, which ranged from 0.65 (idea promotion and idea implementation) to 0.79 (idea generation and idea implementation). Consistently with Janssen (2000; 2001), we constructed our dependent variable as a cumulative score on the three sub-scales. A sample item stated that the subject employee “searches out new working methods, techniques, or instruments”. The supervisors were asked to assess their followers on a value scale that ranged from 1 = “strongly disagree” to 8 = “strongly agree” and thus, the cumulative scores ranged from a theoretical minimum of 9 to a theoretical maximum of 72. Unless differently stated, we used the same value scales for all the other variables in this study. Cronbach’s alpha was 0.94.

Independent variable. We have composed the network of informal advice relationships by asking the employees of Energetica, the following question: “To whom of your colleagues do you turn to for advice in professional, technical, or work-related matters?” The employees then, were asked to check the names of their colleagues from whom they asked advice, and they were free to choose as many sources of advice as they felt as appropriate. For each of the selected contacts then, employees were asked to provide the frequency of advice seeking by answering the following question: “How often do you turn to this colleague for advice?” They had the possibility to select

one of the following three choices: 1 = “less than once a month”, 2 = “At least once a month”, or 3 = “At least once a week”. Consistent with the Burt’s (1992) original formulation, we measured brokerage by first calculating the constraint on our valued network of advice relationships, following the “structural holes” procedure in UCINET. The formula for calculating network constraint is

$$C_i = \sum_j (P_{ij} + \sum_{q \neq i \neq j} P_{iq}P_{qi})^2,$$

where C_i is the network constraint of employee i , while P_{ij} is the proportion of time that employee i invests in the interaction with employee j , and is calculated as:

$$P_{ij} = \frac{z_{ij}}{\sum_q z_{iq}},$$

where z_{ij} measures how frequently employees i and j interact on work-related issues, which in our study may vary from 1 to 3. Hence, the constraint measure C_i can vary from 0 to 1 depending on the extent to which i devotes time directly (P_{ij}) or indirectly ($\sum P_{iq}P_{qi}$) to colleague j . In order to calculate brokerage, we reversed the value of our constraint measure, such that 0 denotes complete constraint, and 1 denotes complete brokerage.

The moderating variable. We have calculated network diversity in UCINET, such that it reflects the heterogeneity -- in terms of professional background -- of contacts from which a focal employee turns out for work-related advice. From the HRM department in Energetica, we have been provided with the professional background for a total of 129 employees, and the five missing cases are the four co-founders of the company and an employee. From the total of 129 employees

for which we have data, 66 are engineers, 43 are economists, and 20 have legal professional background. Accordingly, we have calculated a categorical variable that ranges from 1 = “Legal background”, 2 = “Economic background”, and 3 = “Engineering background”. Consistent with Blau’s (1977) measure of heterogeneity, which was used in several subsequent studies (e.g. Wang et al., 2015b), we calculated network diversity D_i as:

$$D_i = 1 - \sum P_{ij}^2,$$

where P_{ij} is the proportion of professional backgrounds of contacts j , to whom a focal employee i has turned out for work-related advice. The sum of all proportions is then subtracted from one in order to obtain a measure of heterogeneity such that 0 denotes complete homogeneity and 1 denotes complete heterogeneity. For example, if a focal employee A is an economist, and A has turned out for advice to B and C, who are both economists, the network diversity D_i of employee A would be 0. Alternatively, if B, who is an economist, has reported that turns out for work-related advice to D, E, and F, who are all engineers, the network diversity D_i of employee B would be equal to 1.

Control variables. We controlled for several demographic, contextual, and personal characteristics variables, which may potentially confound the hypothesized relations. We have obtained the demographic as well as contextual data from Energetica’s HRM department. Employees’ age was included in our empirical analysis as the past research has shown that supervisors tend to provide higher evaluation scores to their younger followers (Alessandri and Borgogni, 2015). Controlling for gender is important because it may be related to creativity and job performance (Chavez-Eakle

et al., 2006; Roth et al., 2012). Moreover, as Brands and Kilduff (2014) have recently demonstrated, gender may affect the network cognition processes, which in turn, may have an important impact on the interpersonal relationships. We have coded the variable measuring gender as 0 if a case is female, and 1 for male cases. Finally, we controlled for educational level because highly educated individuals tend to perform relatively better in terms of innovative behaviour (Ng and Feldman, 2009). In this study, educational level is a four-categories variable that emulates the Italian educational system.

Considering the contextual variables, we controlled for job tenure and hierarchical position. Controlling for the years spent with the organization is important as it may augment the possibilities for forming more social relationships with the colleagues (Nonaka, 1994), and to affect supervisors' appraisal of one's innovative behaviour (Ng and Feldman, 2013). We kept also hierarchical position constant because prior research has shown that it may affect social network brokerage and innovative behaviour (Ibarra and Andrews, 1993).

Furthermore, we controlled for intrinsic motivation and self-monitoring, as two constructs that may confound our estimates of interest. The individuals who have higher levels of intrinsic motivation perceive their engagement into work-related activities as being driven by the interest and curiosity for the activities itself (Amabile et al., 1994) and therefore, it has been argued that intrinsic motivation will enhance individuals' innovative behaviour (Grant and Berry, 2011). We measured intrinsic motivation by using the original 15-items scale developed by Amabile et al. (1994). Cronbach's alpha was 0.70.

There is a growing empirical evidence showing that chameleon-like individuals, or those that can alter their behaviour in a response to situational cues (Snyder, 1974), are more likely to occupy brokerage positions in social networks (Oh and Kilduff, 2008) and to enhance their job

performance (Wang et al., 2015b). We used the original 12-items scale developed by O’Cass (2000) to measure self-monitoring. Replicating the measurement instrument used by O’Cass (2000), we asked the respondents to state the extent to which they agree or disagree with the statements on a six-point Likert-scale. Cronbach’s alpha was 0.84.

RESULTS

We present the means, standard deviations, and correlations in Table 1 below. One can observe that as expected, social network brokerage is positively correlated with innovative behaviour ($b = 0.29, p < 0.01$). The correlation between the hypothesized moderator (i.e. network diversity in terms of professional background) and brokerage is positive and weak ($b = 0.16, p < 0.10$). In respect to the control variables, *prima facie* evidence reveals that intrinsic motivation is positively and significantly correlated with innovative behaviour, whereas age and hierarchical position have both positive but still weak correlation coefficients with our dependent variable ($b = 0.17, p < 0.10$). When the possible confounding variables of brokerage are considered, it is important to note that brokerage has strong and positive correlation with job tenure ($b = 0.37, p < 0.01$), and hierarchical position ($b = 0.36, p > 0.01$), while its correlations coefficient with network diversity is weak but still positive ($b = 0.16, p < 0.10$). What seems as counterintuitive at first glance, is the correlation coefficient between self-monitoring and brokerage, which we expected to be positive and significant, and therefore, we controlled for this psychometric variable in our empirical analysis. We stress however, that other recently published studies have not found positive correlation between self-monitoring and brokerage as well (e.g. Carnabuci and Diószegi,

2015), thus raising the issue of generalizability of this relationship. It is likely that the relationship is being confounded by variables related to cultural and/or societal contexts in which the fieldworks are conducted.

Table 1: Descriptive statistics

	Mean	S.D.	Min	Max	1	2	3	4	5	7	8	9	10	11
1 Innovative behaviour	47.03	11.09	18	67	1									
2 Brokerage	0.55	0.26	0	0.9	0.29**	1								
3 Network diversity	0.62	0.37	0	1	-0.06	0.16 [†]	1							
4 Intrinsic motivation	85.72	9.54	62	110	0.21*	0.13	-0.12	1						
5 Self-monitoring	51.2	7.48	28	68	0.02	0.07	0.09	0.38**	1					
6 Age	33.95	7.9	23	63	0.17 [†]	0.20*	0.20*	0.07	0.06	1				
7 Gender	0.63	0.49	0	1	0.10	0.10	-0.19*	0.00	-0.04	-0.02	1			
8 Educational level	2.47	0.98	1	4	0.14	0.04	-0.24**	0.07	0.11	-0.07	0.12	1		
9 Job tenure	2.18	1.99	0	10	0.14	0.37**	0.20*	-0.04	-0.01	0.22*	-0.09	-0.15	1	
10 Hierarchical position	1.25	0.56	1	3	0.17 [†]	0.36**	0.22**	0.03	0.06	0.33**	0.04	0.23**	0.28**	1
[†] p < 0.10 * p < 0.05 ** p < 0.01														

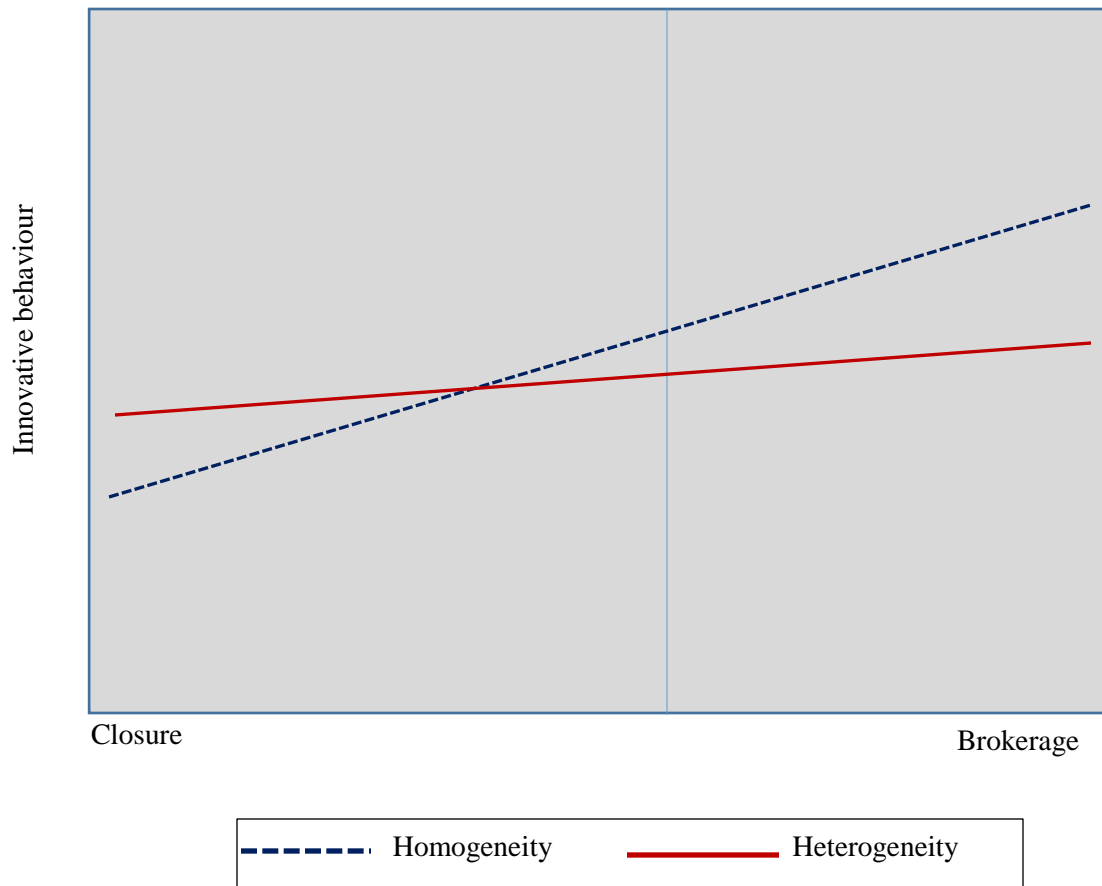
In Table 2, we present the results of our OLS estimations in three nested models. Model 1 reveals the regression results on innovative behaviour when only the control variables are considered. We can observe that intrinsic motivation is the only control variable that has significant, and positive effect on our dependent variable ($b = 0.24, p < 0.05$). This finding is consistent with previous research showing that intrinsic motivation is an important predictor of innovative behaviour (Grant and Berry, 2011). In Model 2, we introduced the two variables of interest, that is, brokerage and network diversity. Introducing the two variables does not improve the overall fit of Model 2, as the difference in F-tests between Model 1 and Model 2 is not significant ($F(2, 108) = 2.17$). However, the non-significant F test is caused by the fact that network diversity does not have a main impact on innovative behaviour, and its inclusion does not contribute to an enhanced fit of Model 2 ($F(1, 108) = 0.40$). The sole effect of including brokerage though, is significant at 0.05 level ($F(1, 108) = 4.12$). Expectedly, the regression coefficient of brokerage in Model 2 is positive and significant ($b = 8.88, p < 0.05$), thus supporting our baseline hypothesis (H1). In Model 3, we introduced the interaction term between brokerage and network diversity. The model fit has substantially improved, as the difference in F-tests between Model 2 and Model 3 is significant at 0.05 level ($F(1, 107) = 4.61$). The joint effect of brokerage and network diversity is negative and significant ($b = -21.12, p < 0.05$), thus supporting our hypothesis (H2) that network diversity negatively moderates the relationship between brokerage and innovative behaviour.

Table 2: Models on Innovative Behaviour

	Model 1	Model 2	Model 3
Constant	32.23** (5.36)	35.61** (6.06)	35.07** (5.97)
<i>Control variables</i>			
Age	0.17 (0.14)	0.16 (0.13)	0.17 (0.13)
Gender	1.91 (2.08)	1.46 (2.09)	1.28 (2.05)
Educational level	1.72 (1.09)	1.40 (1.12)	1.30 (1.10)
Job tenure	0.66 (0.54)	0.44 (0.56)	0.44 (0.55)
Hierarchical position	0.31 (2.17)	0.43 (2.11)	1.32 (2.11)
Intrinsic motivation	0.24* (0.11)	0.23* (0.11)	0.20† (0.11)
Self-monitoring	-0.14 (0.14)	-0.12 (0.14)	-0.11 (0.14)
<i>Independent variable</i>			
Brokerage		8.88* (4.38)	8.39* (4.31)
<i>Moderator</i>			
Network diversity		-1.89 (2.98)	-3.96 (3.08)
Interaction Brokerage * Network diversity			-21.12* (9.84)
N	118	118	118
F	2.19*	2.34*	2.63**
R-squared	0.14	0.16	0.20
Adj. R-squared	0.08	0.09	0.12
† p < 0.10			
* p < 0.05			
** p < 0.01			

Figure 1 shows the predicted margins from Model 3 in a two-dimensional plot, which allows us to visually observe the interaction effect. The two intersecting lines show the expected values of innovative behaviour for the two extreme cases of network diversity, that is, complete network homogeneity, and complete network heterogeneity, while all the control variables are held constant. The values of innovative behaviour are presented as one and two standard deviations above the mean. The vertical dot in the middle part of the plot represents the mean value of brokerage. Figure 1 shows that network structure has opposite effects on innovative behaviour for employees who have homogenous and heterogeneous networks. In other words, brokering more structural holes increases innovative behaviour to employees who are embedded in a homogeneous network of advice relationships, but decreases innovative behaviour to those who are embedded in a heterogeneous network of advice relationships. For example, we may compare two hypothetical employees, Giulia and Stefano. They are both engineers, and they are both embedded in complete brokering networks. Giulia and Stefano have identical characteristics in terms of all (age, educational level, job tenure, hierarchical position, intrinsic motivation etc.) but one aspect. When they have work-related issues, Stefano turns out for advice exclusively to colleagues having unlike professional background. Namely, all the advice providers of Stefano have economic and legal professional backgrounds. Giulia, on the other hand, turns out for advice exclusively to those having alike professional background, that is, engineers. The fitted values of Model 3 imply that the innovative behaviour of Giulia will be indeed, more than one standard deviation higher than that of Stefano.

Figure 1: Predictive margins



Outliers detection management

We have conducted a comprehensive analysis to detect if the data contains any influential observations that may affect our estimates of interest. For this purpose, we followed the suggestions provided by Aguinis et al. (2013), who apart from providing useful guidance on how to detect and manage outliers, call for inclusion of a separate section in academic manuscripts that explicitly state the undertaken procedures to identify and manage influential observations.

To identify if our data contains cases that deviate markedly from other cases in the dataset, we have applied both single and multiple construct techniques. Regarding the single construct techniques, we checked if our three constructs of interest (i.e. innovative behaviour, brokerage,

and network diversity) are normally distributed. It appears that none of the three constructs has a normal distribution (All three Shapiro-Wilk tests had $p < 0.01$). Our analysis on each of the cases located in the tails of frequency distributions shows that there not error outliers, that is, outliers caused by data entry or coding mistakes.

Next, by applying multiple construct techniques we tested if there are outliers based on the scores of predictors and/or outliers based on regression residuals scores (Aguinis et al., 2013). The summary of the analysis is illustrated in Table 3 below. First, we calculated leverage values for Model 3 to check if there are cases that deviate markedly in terms of scores of predictors. The cutoff point was equal to $2(k + 1)/n$, where k is the number of predictors in the regression equation, and n is the sample size. As Table 3 suggests, there are six cases with leverage value above the cutoff point. Regarding the outlyingness based on regression residual scores, we calculated studentized deleted residual values, and it appears that there are seven cases that lye above the cutoff point, which was set at the critical value of t distribution equal to $t_{df} = n - k - 1$. As one can observe in Table 3, only one case (the case with id number equal to 92) has both high leverage and studentized deleted residuals vales. Taking in consideration thus, the findings of the two tests, we may conclude that there are twelve potential outliers in our dataset.

Table 3: Summary of the findings in outliers' detection techniques

Case ID	Leverage	Studentized deleted residuals	Model fit (Δ in R-squared)	Prediction outliers		
				DFFITS	Cook's d	DFBETAS
3		✓*	↓**	✓	✓	X (↓) M (↔) ***
9		✓	↑	✓		X (↔) M (↑)
19		✓	↑	✓	✓	X (↓) M (↓)
32	✓		↔			
39		✓	↑	✓	✓	C (↑)
65	✓		↓			
92	✓	✓	↑	✓	✓	X (↓) M (↔)
93	✓		↔			
102		✓	↑	✓	✓	X (↓) M (↑)
106		✓	↑	✓	✓	X (↑) M (↔)
112	✓		↔			
124	✓		↔			

* “✓” indicates that an observation lays above the cutoff point in a particular outlyingness detection technique.

** “↑”, “↓”, “↔” indicate that an observation increases, decreases, or does not affect the estimate of interest.

*** Following the logic of the previous point, the symbol with X and/or M prior to an arrow indicates the direction in which an observation affects the regression coefficients of the independent, and moderating variables, respectively.

Following the suggestions by Aguinis et al. (2013), we performed four additional tests to determine the extent to which these potential outliers can affect the model fit and parameter estimates. Concerning model fit, we tested if the removal of each of the twelve cases separately, will affect the model fit, as specified by R^2 . It appears that there are six cases, which removal will increase model fit (id = 9, 19, 39, 92, 102, 106). The removal of any of the remaining cases will let the model fit unaffected, or will decrease it.

Finally, to determine the extent to which the twelve potential outliers can affect the parameter estimates, we conducted three specific tests. First, we calculated standardized differences in fits (i.e, DFFITS) and Cook's distances, which both combine information about

leverage and residual distance, and assess the extent to which a case has impact on the slope and intercept of a regression line (Aguinis et al., 2013). As shown in Table 3, all the cases identified in the previous procedure as ones that can potentially affect the model fit lay above the cutoff points for DFFITS (i.e. $\pm 2/\sqrt{(k+1)/n}$) and Cook's distance (i.e. $4/n$). An exception is case with id 9, whose value on Cook's distance is within the allowed margins. Taking in consideration that DFFITS and Cook's distance evaluate the outliers' impact on all regression coefficients as a whole, DFBETAS technique assesses the influence of a particular case on single regression coefficients. By setting the cutoff point at $\pm 2/\sqrt{n}$, we tested the effect of the potential outliers on the predictor variables of interest, that is, brokerage and network diversity. It is apparent that six cases can affect at least one of the two predicting variables, and one case (i.e. id = 39), which was identified in the previous procedures as a potential outlier, can affect the regression coefficients of five out of eight control variables. Table 3 shows that deleting case 9, for example, would not have effects on the regression coefficient of brokerage, but will increase the regression coefficient of network diversity.

Following the guidelines provided by Aguinis et al. (2013), we undertook a 'deletion strategy' for handling the detected outliers. The outliers' detection analysis shows that there are six cases that have been identified as outliers in all the procedures, and at the same time, have the capacity to improve the model fit (id = 9, 19, 39, 92, 102, and 106). The case 3 for example, has been detected as a potential outlier in all the procedures but its exclusion will decrease the model fit, and therefore was left in the dataset. Consistent with the recommendations provided by Aguinis et al. (2013), in Table 4, we report the linear regression models with and without the identified outliers. The left-hand side of the columns under models 1, 2, and 3, replicate the models presented in Table 2, whereas the right-hand side of the columns under these models reveal the results

without the outliers. Concerning Model 1, where only the control variables are included, we can observe that there are two additional control variables that became significant, and positive predictors of our dependent variable. Apart from intrinsic motivation, which was positively and significantly related to innovative behaviour in Model 1 with the outliers, in Model 1 without the outliers we have positive impact on innovative behaviour from educational level ($b = 2.32, p < 0.05$) and job tenure ($b = 1.17, p < 0.05$). Moreover, the model fit increased considerably when we exclude the six outliers ($\Delta R^2 = 0.08$). After including brokerage and network diversity in Model 2, we can observe that the size of the main effect of brokerage has increased in the model that excludes the outliers ($b = 11.83, p < 0.01$), in comparison to the model that includes the outliers ($b = 8.88, p < 0.05$). Finally, as we can see in Model 3, excluding the outliers strengthens the interaction effect between brokerage and network diversity ($b = -26.36, p < 0.01$ in model without the outliers; $b = -21.12, p < 0.05$ in model with the outliers). For further analyzing the significance of the interaction effect in different conditions, we ran additional tests, which we discuss in the following section.

Table 4: Linear regression models with and without the outliers

	Model 1		Model 2		Model 3		Model 4		Model 5	
	<i>with the outliers</i>	<i>without the outliers</i>	<i>with the outliers</i>	<i>without the outliers</i>	<i>with the outliers</i>	<i>without the outliers</i>	<i>with the outliers</i>	<i>without the outliers</i>	<i>with the outliers</i>	<i>without the outliers</i>
Constant	32.23** (5.36)	32.89** (5.04)	35.61** (6.06)	36.64** (5.04)	35.07** (5.97)	35.43** (4.89)	35.07** (1.81)	35.42** (3.32)	35.07** (6.43)	35.43** (6.10)
<i>Control variables</i>										
Age	0.17 (0.14)	0.09 (0.13)	0.16 (0.13)	0.07 (0.13)	0.17 (0.13)	0.09 (0.12)	0.17 (0.08)	0.09 (0.12)	0.17 (0.15)	0.09 (0.14)
Gender	1.91 (2.08)	2.55 (1.94)	1.46 (2.09)	1.19 (1.94)	1.28 (2.05)	1.32 (1.88)	1.28 (1.51)	1.32 (2.07)	1.28 (2.51)	1.32 (2.36)
Educational level	1.72 (1.09)	2.32* (1.09)	1.40 (1.12)	2.20* (1.08)	1.30 (1.10)	1.99† (1.05)	1.30 (1.28)	1.99† (0.72)	1.30 (1.19)	1.99 (1.21)
Job tenure	0.66 (0.54)	1.17* (0.51)	0.44 (0.56)	0.78 (0.51)	0.44 (0.55)	0.82† (0.49)	0.44 (0.32)	0.82 (0.50)	0.44 (0.43)	0.82 (0.49)
Hierarchical position	0.31 (2.17)	1.47 (2.05)	0.43 (2.11)	0.48 (2.07)	1.32 (2.11)	1.52 (2.04)	1.32 (2.62)	1.52 (1.49)	1.32 (2.60)	1.52 (2.51)
Intrinsic motivation	0.24* (0.11)	0.39** (0.11)	0.23* (0.11)	0.33** (0.10)	0.20† (0.11)	0.30** (0.10)	0.20** (0.04)	0.30** (0.05)	0.20* (0.09)	0.30** (0.07)
Self-monitoring	-0.14 (0.14)	-0.21 (0.13)	-0.12 (0.14)	-0.20 (0.13)	-0.11 (0.14)	-0.18 (0.13)	-0.11 (0.07)	-0.18 (0.13)	-0.11 (0.14)	-0.18 (0.14)
<i>Independent variable</i>										
Brokerage			8.88* (4.38)	11.83** (4.13)	8.39* (4.31)	10.97** (4.00)	8.39 (4.31)	10.97* (2.27)	8.39 (5.34)	10.97* (4.48)
<i>Moderator</i>										
Network diversity			-1.89 (2.98)	-3.63 (2.72)	-3.96 (3.08)	-5.86* (2.74)	-3.96 (3.72)	-5.86 (3.02)	-3.96 (3.01)	-5.86* (2.32)
Interaction (Brokerage * Network diversity)					-21.12* (9.84)	-26.36** (9.15)	-21.12* (4.29)	-26.36** (4.62)	-21.12† (10.88)	-26.36** (8.04)
N	118	112	118	112	118	112	118	112	118	112
F	2.19*	4.31**	2.34*	4.64**	2.63**	5.30**	2.63**	5.06**	3.82**	11.36**
R-squared	0.14	0.22	0.16	0.29	0.20	0.34	0.20	0.34	0.20	0.34
Adj. R-squared	0.08	0.17	0.09	0.23	0.12	0.28				
† p < 0.10										
* p < 0.05										
** p < 0.01										

Robustness checks

To check for robustness of the proposed models, we have performed several additional tests. Taking in consideration the nested nature of our data, we added two additional models to account for possible unobserved differences in employees' scores of innovative behaviours across the five business units in Energetica. Such differences might generate clusters in the error structure, thus affecting standard errors and significance levels. To account for these potentially unobservable differences that may affect the interpretability of the results, we augmented Model 3 by specifying cluster-robust standard errors at business-unit-level (White, 1984). By looking at Model 4 (see Table 4 above), we can see that in presence of the interaction term, the effect of brokerage became insignificant in the model with the outliers ($b = 8.39, p > 0.10$), but remained highly significant in the model that excludes the outliers ($b = 10.97, p < 0.01$). What is particularly important is that the hypothesized joint effect between brokerage and network diversity remains significant at 0.05 level in the model with the outliers when we specified cluster-robust standard errors at business-unit-level ($b = -21.12, p < 0.05$). When the outliers were excluded, the joint effect remained significant at 0.01 level ($b = -26.36, p < 0.01$). Taking in consideration that our dependent variable is based on supervisor ratings, in Model 5 we specified cluster-robust standard errors at supervisor-level. When considering a sample with the outliers (see the left-hand side part of the column under Model 5), the hypothesized interaction effect became weaker but still significant at 0.10 level ($b = -21.12, p < 0.10$). However, in a model without the outliers, the joint effect remains highly significant and considerably stronger than in a model with the outliers ($b = -26.36, p < 0.01$).

As an additional robustness check for supporting the proposed interaction effect, we augmented Model 3 by introducing a variable that controls for supervisor's span of control

(Carnabuci and Diószegi, 2015). We operationalized supervisor's span of control as a 'number of subordinates' that directly report to the supervisor, whereas the employees without supervisory role have been assigned a value of zero. Including this variable did not substantially affected our estimates of interest. The regression coefficient of the interaction effect slightly decreased but remained significant at 0.05 level ($b = -20.66$, $p < 0.05$).

Hence, the outcomes of all the additional checks that we have performed to further support the hypothesis 2, suggest that our results are robust and that the hypothesized moderation role of network diversity in the relationship between brokerage and innovative behaviour is negative. The theoretical and practical implications of these results are discussed in the next section.

DISCUSSION

In this paper, we studied the conditions under which social network brokerage affects innovative behaviour. We found that network diversity with respect to professional background negatively moderates this relationship. This finding has three specific, and equally important contributions to the extant literature. First, by showing that network diversity moderates the relationship between brokerage and innovative behaviour, the present study contributes the contingency view of social networks (Carnabuci and Diószegi, 2015; Tortoriello and Krackhardt, 2010). Second, the present study has important implications for the literature that study the effects of social structures on innovative behaviour (Perry-Smith and Mannucci, 2015). And third, we contribute to the diversity theory and research (Gilson et al., 2013; van Knippenberg et al., 2004; 2011), which has traditionally focused on diversity within formally defined organizational units, while we shed light on diversity within the informal networks of advice relationships. In the

following sections, we discuss the two theoretical contributions, its practical implications, and the apparent limitations, which make room for further research into the field.

Theoretical contributions

The support for our baseline hypothesis (H1) does not offer *per se*, particularly novel insights. It empirically confirms that one of the most widely used structural variables in the social network literature, that is brokerage, is positively related to a desired organizational outcome such as innovative behaviour. However, the empirical support that we have found for the baseline hypothesis indicates that brokerage is indeed, an important, and easily generalizable construct that has strong predicting power on the variance of individuals' innovative behaviour. This certainly justifies our efforts to further investigate the moderators that better explain this relationship. By showing that network diversity with respect to professional background works in conjunction with brokerage to predict innovative behaviour, we contribute to the recent debate in the extant literature about the conditions under which differences in social structure affect innovative behaviour (e.g. Carnabuci and Diószegi, 2015; Tortoriello and Krackhardt, 2010).

The empirical support for our H2, where we theorized a negative joint effect between brokerage and network diversity on innovative behaviour sheds new light on the contingency view of social networks. Focusing on the role of individual cognition, the past research has shown that the relationship between brokerage and innovative behaviour is contingent upon several personal characteristics such as self-monitoring personality (Mehra et al., 2001), and cognitive style (Carnabuci and Diószegi, 2015). These studies have advanced our understanding on how the same social structure can lead to differences in the innovative behaviour of brokers depending on their personal characteristics. However, the environmental conditions that enable or impede the brokers

to integrate and process the information and knowledge that come from distinct groups of a network, remained under-investigated (Tortoriello and Krackhardt, 2010). Although the exposure to diverse information and knowledge is critical for brokers to successfully generate novel and useful ideas (Ahuja, 2000), it also imposes challenges for brokers to integrate and make sense of such diverse information and knowledge (Ahuja, 2000). By focusing on professional background, as a category that depicts the knowledge/informational diversity among employees in an organizational setting, this paper shows that the relationship between brokerage and innovative behaviour is contingent upon network diversity with respect to the professional background of advice providers. We argue that brokers will enhance their innovative behaviour if they seek advice (i.e., information and knowledge) from advice providers that have the same professional background as the brokers have. Seeking advice from colleagues having the same professional background will stimulate a development of shared narratives and meanings about the surrounding concepts (Boisot, 1995), thus facilitating communication, and enhancing the ability of advice seeker (i.e., brokers) to successfully integrate the provided information and knowledge (Dougherty, 1992). Indeed, as past research has argued, it is easier to integrate the available information and knowledge if the parties that are involved in such an exchange share some common knowledge base (Ahuja, 2000). Thus, we contribute to the contingency perspectives of social networks by showing that beyond the personal characteristics (i.e., self-monitoring, cognitive style), the environmental characteristics (i.e., the professional background of the advice providers) as well play an important contingent role in the relationship between brokerage and innovative behaviour.

The present study contributes also to the diversity literature, which traditionally has focused on diversity within formally demarcated organizational units such as groups, teams, and

organizational departments (Cheung et al., 2016; van Knippenberg et al., 2010). This line of inquiry has for long studied the effects of diversity within formal units on that units' performance (Cheung et al., 2016; van Knippenberg et al., 2010). The scholars have only recently started to explore diversity from a multilevel perspective, and it has been shown that group diversity is conducive to individual-level creativity (e.g. Gilson et al., 2013). The present study makes a step forward by highlighting the importance of diversity in informal relationships where individuals engage because of instrumental motives. Towards this end, we approached the concept of diversity from a social network perspective. To the best of our knowledge, the concept of network diversity has been applied as a feature of social networks that can affect desired organizational outcomes but not as a contingency variable (Baer et al., 2015; Chen and Gable, 2013). For instance, the study by Chen and Gable (2013) has conceptualized network diversity as the degree to which an ego has formed ties with alters belonging to different cohorts as well as to the relative distribution of ties among the cohorts. The cohorts in this study are defined in terms of belongingness of alters into a corporate department and belongingness of alters to higher hierarchical positions. Hence, the categories over which the network diversity is calculated mirrors the most important features of a formal organization such as structured communication flows (i.e. departments) and legitimate authority (i.e. higher hierarchical positions) (McEvily et al., 2013). Instead, in the present study we focus on professional background as a category over which we operationalized the network diversity. The professional background is not a formally defined organizational unit but still can capture the informational/functional diversity (Anteby et al., 2016). Moreover, given the divisional structure of the company individuals belonging to the same professional background could work in different organizational business units (e.g. economists work at the Sales department of the five business units), and thus, the studies that operationalize diversity with respect to formally defined

categories such as department, may overestimate the effects of diversity on desired organizational outcomes. Our objective was to understand how the concept of diversity with respect to professional background, as a category that captures the informational/functional diversity, can affect individual-level outcomes such as innovative behaviour. By showing that professional background diversity works in conjunction with brokerage to predict innovative behaviour, we offer an additional moderator that can be integrated within the CEM model proposed by van Knippenberg et al. (2004), which posits that diversity effects on desired organizational outcomes are better predicted if studied in conjunction with a range of possible moderating variables.

Practical implications

Our study offers important insights for the managers and practitioners, who want to enhance the innovative behaviour of their employees. The empirical support that we found for the baseline hypothesis suggest that apart and beyond the formal organization, managers and practitioners should focus on the patterns of informal relationships among the employees. Our findings show that social capital that stem from closed as well as brokering network positions can be beneficial for innovative behaviour. Collecting social network data thus, can be a useful practice aimed at increasing the social capital among the employees (Cross and Parker, 2004). By drawing the informal map of relationship at the workplace, managers and practitioners can understand the patterns of information and knowledge flow among the employees. Since the baseline hypothesis predicted that brokering network position will be positively related to innovative behaviour, managers and practitioners should ensure that the informal network relationships is rich in structural holes. This can be achieved by stimulating the informal interaction among seemingly disparate organizational units. This can be done by bringing the members from distant organizational units together at formal as well as informal organizational meetings or events.

The second practical contribution of this study stems from the support that we found for our second hypothesis, which suggests that brokerage interacts with network diversity in respect to professional background to affect innovative behaviour. This finding has straightforward implications for all organizational employees, including the managers. Our theory suggests that employees embedded in closed network of relationships will increase their innovative behaviour if they seek work-related advice from colleagues that have unlike professional background. In that way, closely embedded employees can expose themselves to diversified information and knowledge that circulates among diverse professional groups, thus offsetting the weaknesses associated with closed network position such as information and knowledge redundancy. On the other hand, employees embedded in brokering network positions will increase their innovative behaviour if they seek work-related advice from colleagues that have alike professional background. In that way, the brokers will facilitate communication and flow of resources, thus offsetting the weaknesses associated with brokering network position such as difficulty to integrate and process the available information and knowledge.

Limitations and future research

The first, and probably the most striking limitation of our study is the potential risk for endogeneity between brokerage and innovative behaviour. Indeed, the specific personal as well as contextual characteristics of individuals such as the “Big five” personality traits, expertise, talent, and experience can affect not only the innovative behaviour but also the respective position of an individual within a network of instrumental relationships (e.g. Anderson, 2008; Fang et al., 2015; Tortoriello and Krackhardt, 2010). In an attempt to minimize the potential for endogeneity, and in line with prior research in the field (e.g. Anderson, 2008; Carnabuci and Diószegi, 2015), we have

controlled for key personal characteristics such as intrinsic motivation and self-monitoring. We kept constant also several important contextual variables such as educational level, tenure, and hierarchical level, as context-related variables that may confound our relationship of interest (e.g. Carnabuci and Diószegi, 2015). Consistent with the practices applied elsewhere (Cheung et al., 2016; van Knippenberg et al., 2011), we ended network data collection two weeks before we approached company's supervisors, who were asked to score the innovative behaviour of their subordinates. The different sources as well as the time lag between the two surveys should mitigate the potential risk for common method bias, and for endogeneity between our independent and dependent variables. However, we make a call for future studies that may apply longitudinal research methods to investigate further the potential for a reverse causality in the relationship between brokerage and innovative behaviour.

In order to capture the diversity of information and knowledge that circulates in an organization, in this study, we examined the moderating effect of network diversity with respect to professional background in the relationship between brokerage and innovative behaviour. Taking into consideration that the past research has shown that network diversity with respect to demographic variables such as tenure, education and gender, may affect one's network positions (e.g. Wang et al., 2015b), future studies may investigate the moderating effect of network diversity, seen through the lenses of various categories such as age, gender, tenure, as well as personality traits.

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